

The background of the entire page is a complex, repeating geometric pattern. It consists of numerous thin, black lines that intersect to form a variety of triangles and polygons. Some of these shapes are filled with a light gray color, while others are white. The overall effect is a dense, textured, and somewhat chaotic yet rhythmic visual field.

# **Provoking Technophilia:**

## **The Umfundisi Tech Centre & Portable Fundi Labs**

A dissertation undertaken by Brent Carelse,  
under the supervision of Associate Professor Nicholas Coetzer and Melinda Silverman  
and assisted by Jennifer Beattie

This dissertation is presented as part fulfilment of the degree of Master of Architecture (Professional)  
in the School of Architecture, Planning and Geomatics, University of Cape Town  
28 November 2014



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# Abstract

This thesis stemmed from the idea that we as a society find it harder and harder to understand even the everyday technologies around us. It is argued that despite the seemingly limitless opportunities for self-learning in the 'information age', an interest for the technological is still not fostered within our society. This dissertation is inspired by Cedric Price's proposal that,

*"[...]every town should have a space at its disposal where the latest discoveries of engineering and science can provoke an environment for pleasure and discovery[...]".*<sup>1</sup>

It started with the search for a spatial models through which people could learn about and experience the essence of technology. The initial research looked at different ways people have learned about technology

throughout history, focusing particular on examples where education could successfully be combined with leisure or recreational activities. It was important that the model proposed, not only taught people, but also inspired a sense of marvel and wonder through engagement with technology. Based on principles gleaned from the research a project was proposed which would manifest itself in two different, but inter-related architectural explorations. The first is a sort of 'headquarters' or 'mothership' for a new model of the education of technology. It finds itself in the Woodstock industrial area, and would serve as a resource to the greater Cape Town. The second is a prototype for mobile, rail-based workshops that would be developed and manufactured within the headquarters. These units would act as 'satellites', spreading the spirit of this movement across the country to areas where the resources for such education may not exist.

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<sup>1</sup> Stanley Matthews, *From Agit-Prop to Free Space: The Architecture of Cedric Price* (London: Black Dog Publishing, 2007), 66.



# Contents

<b>Table of Figures</b>	VII
<b>Preface</b>	2
<b>Section 1: Technophobia? Technophilia?</b>	5
At the Root of Our Fears –Heidegger on Technophobia	6
The Question of Education in an Information Age	10
<b>Section 2: Principles</b>	13
Principle 1: Leisure Learning	14
The Chautauqua Movement	14
The Fun Palace (1964), Cedric Price	20
Principle 2: Learning Through Making	22
Repair Cafés	22
The Potteries Thinkbelt (1966), Cedric Price	24
Principle 3: Didactic Technology	28
<b>Section 3: The Project</b>	31
The Development of a New Typology	32
The Mothership	32
The Satellites	34
Site Selection for the Mothership	36
The Umfundisi Tech Centre - The Mothership	48
Fundi Labs - Satellite Workshops	70
<b>Conclusion</b>	75

# Table of Figures

(All images to be considered as author, unless otherwise stated.)

**Figure 1:** A cutaway view of the Volkswagen *Golf Mk1* as depicted on the cover of the Haynes Owners Workshop Manual: VW Golf, Jetta & Scirocco.

Source: Haynes. *Haynes Owners Workshop Manual: VW Golf (Petrol), Jetta & Scirocco*. Haynes Publishings, 1979

**Figure 2:** Photo of the Apple iPhone 6 Plus. The products design philosophy places great emphasis on ‘streamlined’ and ‘seamless’ form.

Source: Apple inc., “iPhone 6”, 2014, <http://www.apple.com/za/iphone-6/>, Apple (accessed: October, 17th, 2014)

**Figure 3:** Heidegger uses the example of the making of a chalice to demonstrate the theory of causality.

Source: ‘Heidegger: The Question Concerning Technology’, *CriticalLink*, <http://www.english.hawaii.edu/criticalink/heidegger/guide2.html>, (April, 9, 2014)

**Figure 4:** An advertisement for a Chautauqua event.

Source: Venekamp, Linda. “History”. *Welcome to Chautauqua*. Partly Sponsored by LOFTI, <http://www.campus-school.dsu.edu/myweb/history.htm> (March, 19th 2014)

**Figure 5:** Families watch on attentively during a Chautauqua Event.

Source: Walker, R.D. “Lost Americana: Chautauqua Assemblies.” *The Real Revo*. Original publication June, 26th, 2011. <http://therealrevo.com/blog/?p=49346> (Accessed September, 18th, 2014)

**Figure 6:** Diagram explaining the step-by-step process of erecting a big top.

Source: Circus Historical Society, Inc. “How They Set Up the Big Tent”, *Circus Historical Society* 2003. <http://www.circushistory.org/History/Tent.htm> (February, 24th 2014)

**Figure 7:** Photo depicting the erection of a circus big top.

Source: Ryan, Dennis. “Digital Photograph - Holden Brothers Circus, ‘Big Top ‘ Circular Tent being Raised up Central Pole surrounded by Caravans & Tents, early 1930s.” *Museum Victoria*. <http://museumvictoria.com.au/collections/items/1689827/digital-photograph-holden-brothers-circus-big-top-circular-tent-being-raised-up-central-pole-surrounded-by-caravans-tents-early-1930s?createComment=True> (Accessed September, 18th, 2014)

**Figure 8 (top):** Internal view of the Fun Palace showing the systems of circulation and almost machine like interior.

Source: Matthews, Stanley, and Hobart and William Smith Colleges. “The Fun Palace as Virtual Architecture: Cedric Price and the Practices of Indeterminacy” *Journal of Architectural Education* Volume 59, Issue 3 (2006): p.39

**Figure 9 (middle):** External view of the project in its intended context. The skeletal appearance of the building makes it seem like an uncompleted structure.

Source: Matthews, Stanley, and Hobart and William Smith Colleges. “The Fun Palace as Virtual Architecture: Cedric Price and the Practices of Indeterminacy” *Journal of Architectural Education* Volume 59, Issue 3 (2006): p.39

**Figure 10 (bottom):**

Source: Matthews, Stanley, and Hobart and William Smith Colleges. "The Fun Palace as Virtual Architecture: Cedric Price and the Practices of Indeterminacy" *Journal of Architectural Education* Volume 59, Issue 3 (2006): p.39

**Figure 11:** A photo of repairs being done at the Stichting Repair Cafe, in Amsterdam

Source: Njikiktjen, Ilvy. "Stichting Repair Cafe", May, 2nd, 2012

**Figure 12:** Ideas regarding mobility and interconnectivity are evident from Price's diagrams. This diagram depicts how two rail cars can stop parallel to each other, and how resources could be exchanged between the two.

Source: Matthews, Stanley, and Hobart and William Smith Colleges. "The Fun Palace as Virtual Architecture: Cedric Price and the Practices of Indeterminacy" *Journal of Architectural Education* Volume 59, Issue 3 (2006): p.39

**Figure 13:** A perspective drawing Price did depicting the view someone would have from the rail car while entering one of the Thinkbelt facilities.

Source: Matthews, Stanley, and Hobart and William Smith Colleges. "The Fun Palace as Virtual Architecture: Cedric Price and the Practices of Indeterminacy" *Journal of Architectural Education* Volume 59, Issue 3 (2006): p.39

**Figure 14:** Diagram showing the three key Transfer areas, and purposes of each.

**Figure 15:** Digital simulations and studies done by the design team during the development of the system.

Source: 'Hybgrid', *Achimmenges.net*, <http://www.achimmenges.net/?p=4407> (March, 19, 2014)

**Figure 16:** Photo of the Hybgrid system being used in a matrix to form a roof-like structure.

Source: 'Hybgrid', *Achimmenges.net*, <http://www.achimmenges.net/?p=4407> (March, 19, 2014)

**Figure 17 (top):** Early ideas of the relationships between the various elements of the buildings programme.

**Figure 18 (bottom):** diagram depicting early ideas of structural adaptability for the Mothership.

**Figure 19:** Map depicting the rail network across the Western Cape.

**Figure 20:** A progressive housing design by Abacus architecture. This was done for a competition where the winning design would be built by a mobile home manufacturer on a production line.

Source: Robert Kronenberg, ed. "Introduction" *Portable Architecture* (Great Britain: Elsevier/Architectural Press, 2003).

20

**Figure 21:** A mobile Chinese assault tower. This portable building follows a model where the architecture includes its own system for mobility, and is all-encompassing.

Source: Robert Kronenberg, ed. "Introduction" *Portable Architecture* (Great Britain: Elsevier/Architectural Press, 2003).

**Figure 22:** Study of initial site options.

**Figure 23:** Second study of smaller, more centrally located site options

**Figure 24:** Aerial perspective looking towards the site.

Source: Google Earth 2013.

**Figure 25:** Photo of the Old Castle Brewery taken during a time when the building was still used as a cold store.

Source: Old Castle Brewery Building © 2014, "Departure of SA Breweries and thereafter", *The Old Castle Brewery*, [http://www.oldcastlebrewery.co.za/departure\\_sa\\_breweries.php](http://www.oldcastlebrewery.co.za/departure_sa_breweries.php) (March, 12, 2014)

**Figure 26:** View towards the site, for the pedestrian walking along the Lower Church Street overpass. The harsh condition of the sidewalk, which can be seen in the right of the photo, also leaves pedestrians vulnerable and exposed.

**Figure 27:** View towards the site, from just in front of the Old Castle Brewery, and towards the Lower Church Street overpass. The heights of the overpass can be seen in this photo.

**Figure 28:** View towards the site, from the Lower Church Street overpass. Although quite overgrown with vegetation, the rail siding can be seen running approximately in the centre of the photo.

**Figure 29:** Early spatial configuration explorations of the pedestrian walk way could relate to the internal building.

**Figure 30:** Spatial configurations options. Public areas are placed along the Lower Church Street Elevation. While making spaces are expressed as tall boxes which into which passers-by can gaze.

**Figure 31:** Movement studies of the area around the site with the existing and new road layout.

**Figure 32:** Section of early design, soon after the new road layout.

**Figure 33:** Plan of early design, soon after the new road layout.

**Figure 34:** Exploded axonometric which explored how the buildings structure and programme could begin to relate.

**Figure 35:** Graphic depicting the relationships between the various elements of the buildings programme.

**Figure 36:** *Draft A* layout with parking, and public functions on Ground Floor. Semi-private and private functions which require more security are on the First and Second Floors.

**Figure 37:** *Draft B* layout with parking in a Basement (approx. -2.00m). Ground Level is then split into a Lower (approx. 0.00m) and a Upper Ground Floor (approx. 1.00m).

**Figure 38:** Exploded axonometric of the buildings 'big ideas'. What is of particular significance was the decision to articulate the buildings ,most public, East facade as an exploration of didactic opportunities in architecture.

**Figure 39:** Exploded isonometric view of the buildings skin technology. Skin is locally openable through a system of gears and levers.



**Figure 40:** Building Floor Plans. Scale: NTS

**Figure 41:** Exploded axonometric of building. Scale: NTS

**Figure 42:** 3D Views of project

**Figure 43:** Long Section of building

**Figure 44:** Model of building in context.

**Figure 45:** Concept sketches for the development of the Fundi Labs.

**Figure 46:** Explorations of strategies for the mobility of the Fundi Labs.

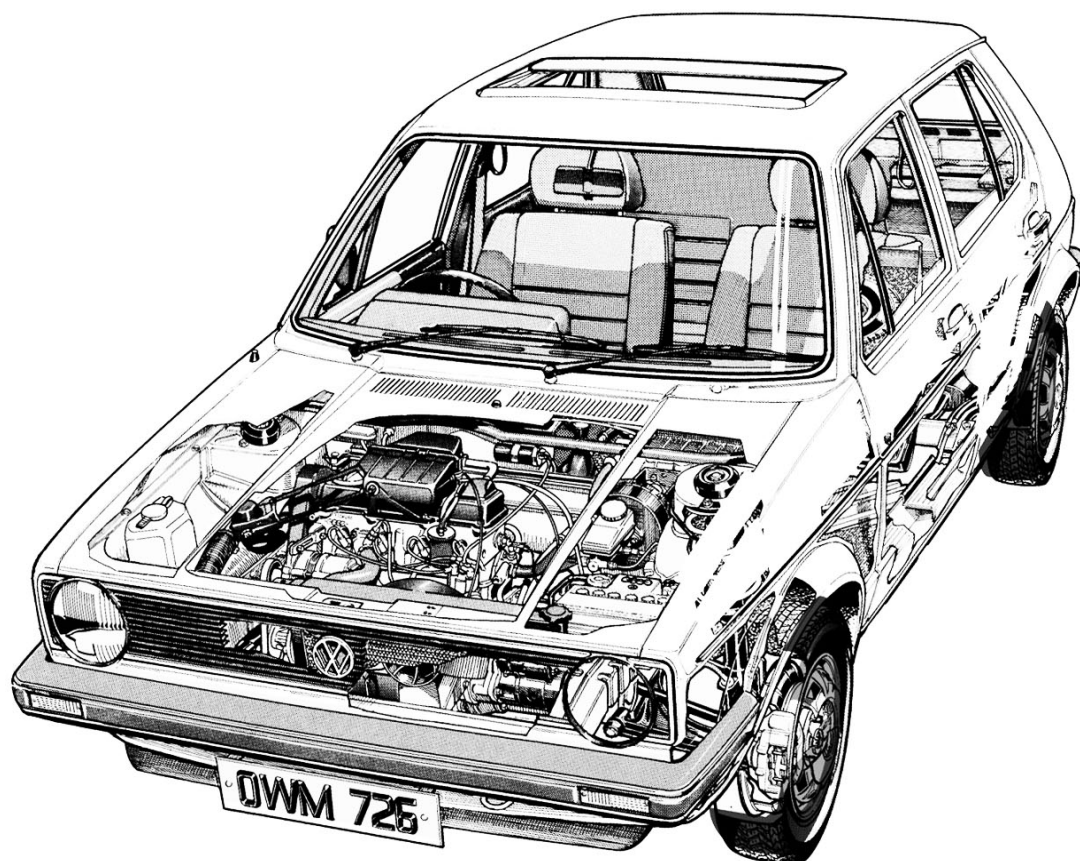


Figure 1: A cutaway view of the Volkswagen Golf Mk1 as depicted on the cover of the *Haynes Owners Workshop Manual: VW Golf (Petrol), Jetta & Scirocco*.

# Preface

The ideas explored in this dissertation found their origin in a very personal reflection on what I experienced as my own *technophobia*. This anxiety stemmed from my awareness of how inept I was within the realm of technological thinking, despite how dependent I am on the technology I use. These feelings were perpetuated by a sense of helplessness when these technologies would malfunction or break down. When I use the term *technology*, I speak here of the kinds of devices, machinery or modes of transport we all rely on, for our day-to-day activities. The truth is many of us lack even a basic understanding of the technologies we work with. And even when we try to gain information about these devices, without a foothold within technological thinking, we find it hard to navigate the vast collection of information available.

To shed some light on my situation, at the start of 2011 I had made the decision to move into my own place and attempt to become more independent. My father, as part of his recognition of my noble intentions (and perhaps in an attempt to spur on such a spirit of independence) was kind enough to buy me my first motor vehicle. The budget was modest, but the car would have to be in a reliable, road worthy condition. It was also preferable that it be easy and cheap to maintain myself. After much searching I eventually managed to find a 1987 *Citi Golf*. Its old age was of course part of its charm. After doing all the recommended inspections, my father and I agreed that the car had been well looked after and was probably one of those ‘from up-country’ vehicles, which promised a long lifespan despite its age. Also, since its design was very basic, I felt that it could also be a good opportunity for me to fix any minor hiccups myself, and learn a bit about vehicle mechanics in the process. Besides, there is so much DIY videos and forums online; from basic oil changes to rebuilding carburettors. How hard could it really be?

Despite the car being in a good condition, like all cars (and all technologies) it was bound to malfunction at some stage. And that it did, for many occasions that year. I soon realised that some repairs, however minor

could quickly fall outside my budget if done by most automotive specialists. I, like many South African vehicle owners, found it hard to afford the relatively high costs of automotive related services. As a result I had to take it upon myself to repair as much as possible. I also learned that properly diagnosing a problem on a motor vehicle can of itself require some skill and experience. And even after you have managed to nail down the problem, actually finding the right solution in a online ocean of ‘good advice’ and tutorials often requires a body of rudimentary knowledge in itself. However despite the challenges I faced in trying to fix my own car, few feelings rival the satisfaction you experience when you get it right. And in hindsight the solution always seems so obvious and basic. Yet why did it take so long? And why did it cause so much stress and anxiety?

This project manifests itself in two different, but related architectural explorations. The first is a ‘headquarters’ for a new model in the education of technology. It finds itself in the Woodstock industrial area, and would serve as a resource to the greater Cape Town. The second is a prototype for portable workshops which would be developed and manufactured within the headquarters. These units would act as ‘satellites’, spreading the spirit of this movement across the country to areas where the resources for such education may not exist.



# *Section 1*

## *Technophobia?*

## *Technophilia?*

The topic of technophobia was particularly fascinating to me because I saw it as an anxiety that not only I faced, but perhaps a problem of education at a societal level. I had been wrestling with my own feelings of despair in the realm of technology; At the same time it was something that brought me great enjoyment at the moments when I had developed a foothold within it. I wondered how we could become familiar with a world of knowledge that is so vast and interrelated. How could we find a way into it and how could we orientate ourselves within it?

## At the Root of Our Fears – Heidegger on Technophobia

Key consideration for the valuation of technological artefacts often place emphasis on functionality and performance. Even current denotations of technology describe it as ‘a tool used to achieve a desired outcome’.<sup>1</sup> Martin Heidegger calls this an *anthropological definition of technology*.<sup>2</sup> The importance of technology in our lives is of course a daily reality, and the goal of technology: to simplify and improve mankind, is in and of itself a noble one. We have, however, grown ever more dependent on the tools we use, but are unable to engage with them at even a basic level. Technological development has left society further and further behind and the relationship between man and technology has grown increasingly strained. Because of this ineptitude man grows increasingly anxious. As Heidegger stated,

*The will to mastery becomes all the more urgent the more technology threatens to slip from human control.*<sup>3</sup>

Our view of technology as merely an instrument will not suffice. For, as according to Heidegger, the nature of our relationship with technology has left us with no other option but to endeavour to master it, an endeavour which most of us very seldom fulfil. We are unable to enjoy the freedom that comes from the essence of what it is. The view of technology as an instrument ends up leaving it as nothing more than a means to an end. As Heidegger says,

*So long as we represent technology as an instrument, we remain held fast in the will to master it. We press on past the essence of technology.*<sup>4</sup>

Though the anthropological definition of technology is probably as literal and ‘correct’ a definition as we might find, as Heidegger points out, the most literal definition of something may still fail to spell out the truth or essence of what it is. Heidegger promotes the importance of a process of questioning as a means to understanding the *essence* of what something is. Essence, as opposed to its literal definition, may be more valuable to us because the idea of ‘essence’ focuses on a thing’s relationship to our humanity. Heidegger states that when we acknowledge the essence of technology, it is then that we are free to properly experience it. Even though the essence of technology may not explicitly be technological, an understanding of the essence of any human activity is more important because it will liberate the relationship between man and that activity. This process is crucial for developing a holistic understanding of any matter.

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1 The Definition of technology according to the Merriam Webster Dictionary is as follows: the use of science in industry, engineering, etc., to invent useful things or to solve problems: a machine, piece of equipment, method, etc., that is created by technology the making, modification, usage and knowledge of tools, machines, craft systems and methods of organisation in order to solve a problem, improve a pre-existing solution to a problem, achieve a goal, handle an applied input/output relation or a specific function. Merriam Webster Dictionary (2014)

2 Martin Heidegger, “Questions Concerning Technology.” in Questions Concerning Technology and Other Essays, ed. William Lovitt (New York & London: Garland Publishing, 1977), 5.

3 Martin Heidegger, “Questions Concerning Technology.”, 5.

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4 Martin Heidegger, “Questions Concerning Technology”, 32



Figure 2: Photo of the Apple iPhone 6 Plus. The products design philosophy places great emphasis on 'streamlined' and 'seamless' form.

The anthropological definition does however have some value in our investigation of the essence of technology. What the instrumental definition teaches us is that technology serves an *end*. It can be seen as something which has an *effect* and thus forms part of the realm of *causality*.<sup>1</sup> Causality was first expounded on by Aristotle and is used to explain objects that have the ability to invoke an effect. Heidegger explores causality in an attempt to find the essence of what technology is. Causality is broken up into four facets and consists of:

- The *causa materialis* – This is the raw material or constituents from which it is made. The turning of raw materials into usable objects can be understood as the realisation of a potential.

- The *causa formalis* - The shape or form into which it is fashioned. This can be a pre-existing likeness or type, or a new likeness as in the case of the moment of invention. In architecture this can be translated into the discussion of building typology.

- The *causa finalis* - The end for which it is made. The ritual or cultural practice which creates the need for its existence. This facet has direct bearing on the *causa formalis* and determines the overarching features of its eventual design.

- The *causa efficiens* - the person who has an actual hand in the forming of the object, whether it is a designer, engineer, artisan or architect. In most instances, the finer determinacies of its design come from the particular working method of this person.

Heidegger's understanding of causality goes a step further. He explains that the four causes constantly reference each other and work together in the co-production of an object. The object is thus indebted to all four of the causes. That is to say, the maker (*causa efficiens*) is not merely an outside entity to the production of the object. The designer is just as responsible for the actualisation of the object he fashions as the material from which he fashions it.<sup>2</sup> It is in light

of this that we approach an alternative definition of technology; an activity which stems from our human nature. Man cannot help but bring to light the existing potentials embedded within the reality of our world. In light of this view, we might then be able to say that , despite the divide between man and technology, man inherently has the potential to be technophilic.

Perhaps it is then a limited position to only value efficiency and seamlessness within technology. Would technology not be of greater benefit if value sets for how we judge technology included how easily it lends itself to be engaged with and understood by us?

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1 Martin Heidegger, "Questions Concerning Technology", 6

2 Martin Heidegger, "Questions Concerning Technology", 8.



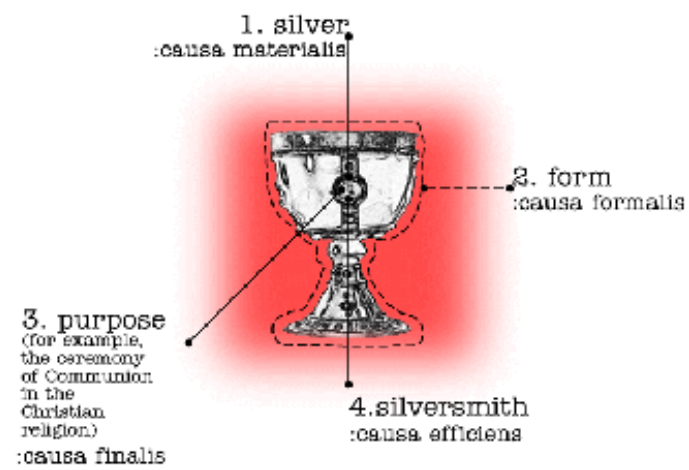


Figure 3: Heidegger uses the example of the making of a chalice to demonstrate the theory of causality.

## The Question of Education in an Information Age

I had the notion that our misconceptions of technology could be addressed through education. I saw it partly as a psychological problem. 'If only we had a way of being properly introduced to the wonder of technology?', 'How can we be introduced to a world that is so vast and overwhelming? The problem however could also be seen as a social one. This is to say that we not only have a dilemma in how we relate to technology, but technology has also made it harder for us to engage with one another. The opportunities of *self-learning* presented by the age, has made institutionless learning not only possible, but an increasingly popular means of learning.<sup>1</sup> Today if you are unable to install a particular computer program or replace a component in your motor vehicle, it is completely possible to go on the internet and search for a tutorial or video that shows you how. And so we learn in new ways. However, as a side effect of our information age, the individual has begun to find less and less need to engage with his peer (something that can be argued to be fundamental to the learning of technology). The very networks and mechanisms which were created to develop interconnectedness in society have also caused us to further isolate ourselves. Marshall Berman discusses this and says,

*To be modern is to find ourselves in an environment that promises us adventure, power, joy, growth, transformation of ourselves and the world – and, at the same time, that threatens to destroy everything we have, everything we know, everything we are [...]*

The seeking of a new architectural typology for the education of technology thus began with asking a question which was not architectural: How can we as a society be reacquainted with technology? This lead

to the spatial enquiry: If the education of technology requires human interaction, how can architecture best provide such learning. Underpinning this dissertation is the belief that the development of new architectural typologies cannot merely come from spatial points of departure but rather from new ways of reading society. After all, the question of architectural programme originates in the truths of its users; namely society. For whenever we approach design, our initial considerations inevitably stem from social (read: sociological / psychological / political / philosophical) readings. The design brief is, in itself, a document that puts into words a reading (or unfortunately sometimes, a misreading) of the realities of our world. Our designs are thus speculations of what appropriate responses to these readings might be. In order to formulate new, and hopefully better architectural interventions; we must first rethink our own understandings of society.

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<sup>1</sup> Max Nixen, "Degree of Interest – It's Not Just Google That Cares Less about Hiring Graduates from Top Schools." Quartz. February, 26th 2014. <http://qz.com/181178/its-not-just-google-that-cares-less-about-hiring-graduates-from-top-schools/> (April, 10th 2014)





## *Section 2*

### *Principles*

This project emanated from a body of research relating to the various ways people learn about technology. Although the following case studies may appear vastly different from one another, they provide key ideas for what would become the search of a new architectural typology. These ideas have been distilled into three main principles which will be outlined in this section.

## Principle 1: Leisure Learning

Much can be said about the state of *leisure* and the state of *learning* in our day and age. For the most part our experiences of leisure and learning are that of consumption. It is far too seldom that our play allows us to build real capacity within ourselves. Similarly our most traditional methods of learning are passive. The understanding of new hybrids of education and recreation requires the problematising of both the ways in which we play and the ways in which we learn. Cedric Price considered this when he lamented the state of society,

*We are an apathetic people, if we do not now attempt to make a new art of living instead of escaping from living into a rather dreary art. As a temporary measure the proposal has been put forward that every town should have a space at its disposal where the latest discoveries of engineering and science can provoke an environment for pleasure and discovery, a place to look at the stars, to eat, stroll, meet and play.*<sup>1</sup>

### The Chautauqua Movement

*Chautauqua* was an American education movement which emerged in the late 19th century. It comprised of lectures, live performances, concerts and presentations; a unique mixture of entertainment and education. Many important topics relating to political, social, religious and cultural issues were covered within Chautauquas but, like its predecessor, the Lyceum movement, an important focus in Chautauqua circuits was the education of new and emerging technologies.<sup>2</sup> However Chautauqua was not just about the endow-

ing of information to the masses; it proposed new sets of social values and cultural practices in response to the development of the technologies of its time. Here we see the ability for education, or more particularly the education of technology, to permeate into every sphere of society. Of course there is always the opportunity for a movement with such momentum and influence to be used for self-interest and private gain. To an extent such was the case with Chautauqua. As an example, the agenda of the railroad was appetised by stories of the outside world and its opportunities. This was then followed by the sub-theme of the 'accelerated removal of Native Americans' who were of course occupying land the rail road companies wanted access to.<sup>3</sup> Despite these occasional propagandic undertones, Chautauqua was largely viewed as an aggressive protagonist of change and development at its time. The idea that people can learn through recreational activities is, of itself, an important one. The discovery of knowledge should be something which at its core brings people enjoyment. Man wants to understand something, as fully as it can be understood, or as far as he is able to comprehend it. What is also significant is the impact the method of learning had on the general sentiment society held towards the topic of technology. This was a time when society at large was curious about the inner workings of technology. It is not unreasonable to imagine that movements like Chautauqua served to further provoke this.

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1 Stanley Matthews, *From Agit-Prop to Free Space: The Architecture of Cedric Price* (London: Black Dog Publishing, 2007), 66.

2 Charlotte Canning "Traveling Culture: Circuit Chautauqua in the Twentieth Century". University of Iowa Libraries. <http://www.lib.uiowa.edu/sc/tc/> (February, 19th 2014)

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3 'Free Land? 1862 and the Shaping of Modern America'. National Park Service – Homestead National Monument of America. <http://www.nps.gov/home/planyourvisit/chautauqua.htm> (February, 19 2014)

*Attend*  
**Chautauqua**  
*You'll Enjoy it*

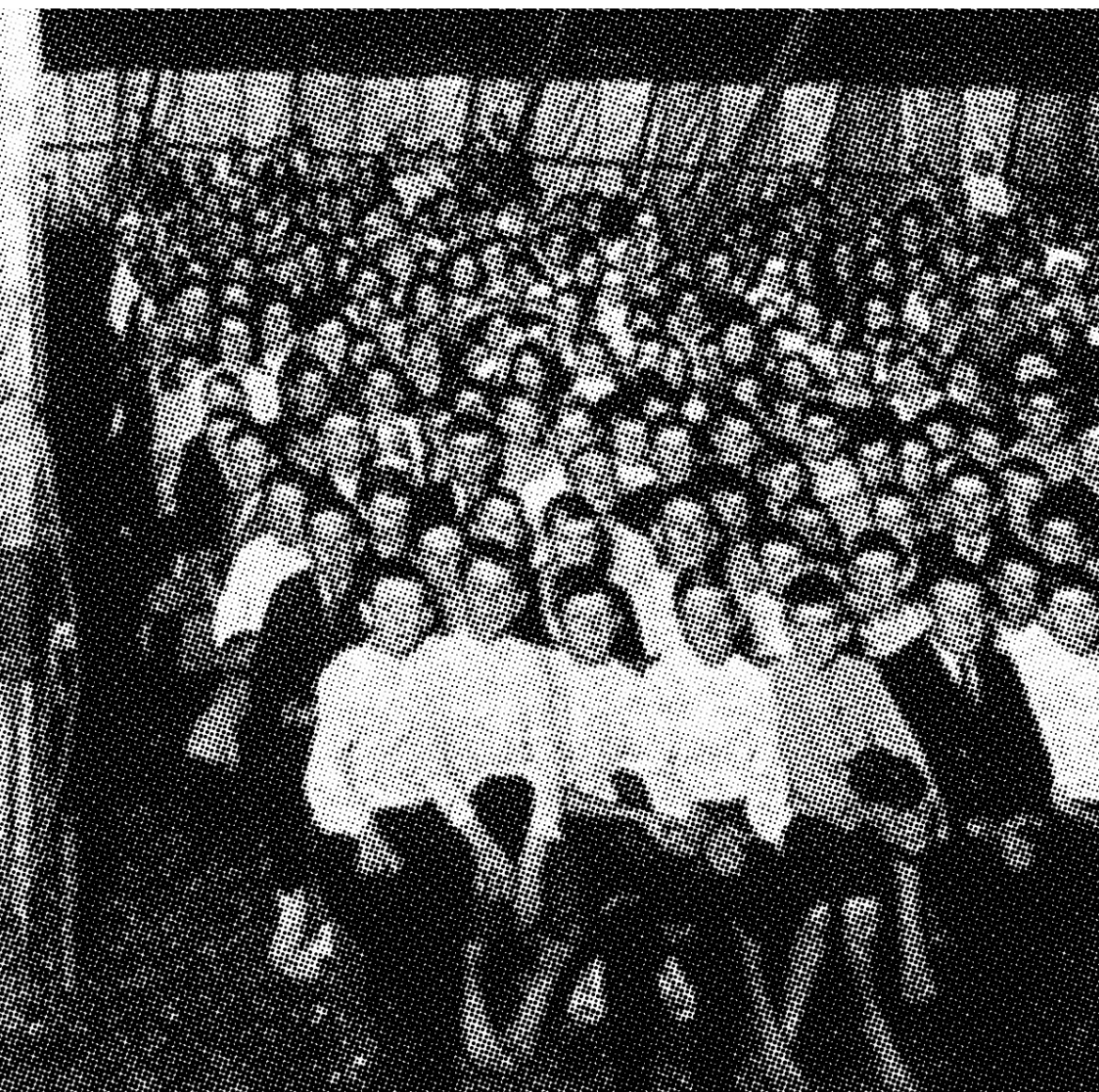
Figure 4: An advertisement for a Chautauqua event.





Figure 5: Families watch on attentively during a Chautauqua Event





Today, one might imagine exciting and radical architectural projects for such a programme. Sadly, though none of the existing structures for Chautauqua, except for the Shelbyville Chautauqua Auditorium, really exhibit any spatial or structural innovation. No great typologies exist for Chautauqua. This is perhaps due to the fact that its peak in popularity only lasted for roughly 50 years (from 1874 to sometime in the mid-1920s). Or that for quite some time Chautauqua only occurred as a temporal event, and took place in existing town halls, or tents

But perhaps this latter point is of some spatial significance in itself. The temporary nature of Chautauqua meant that it was an occasion that required the setup and breakdown of its structures. This aspect of Chautauqua gave it some resemblance to the circus. The idea of occasion made Chautauqua feel less like an organisation and more like a social event for the whole community. Here we see the ability for something that is only temporary to leave lasting change by sparking within society a sense of wonder and marvel about technology.

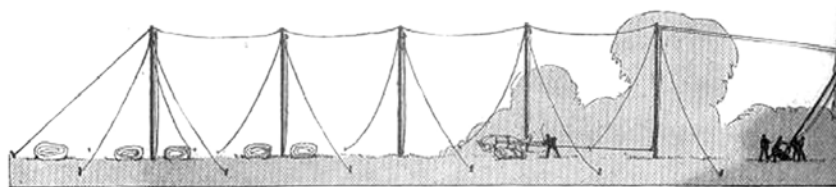


Figure 6: Photo depicting the erection of a circus big top.

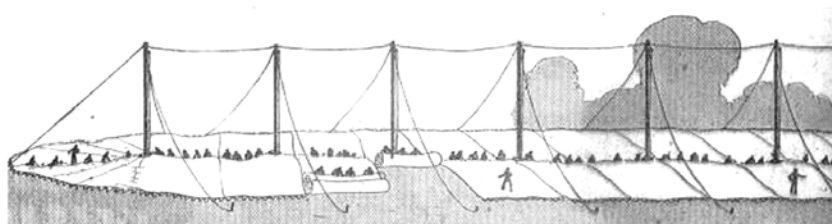




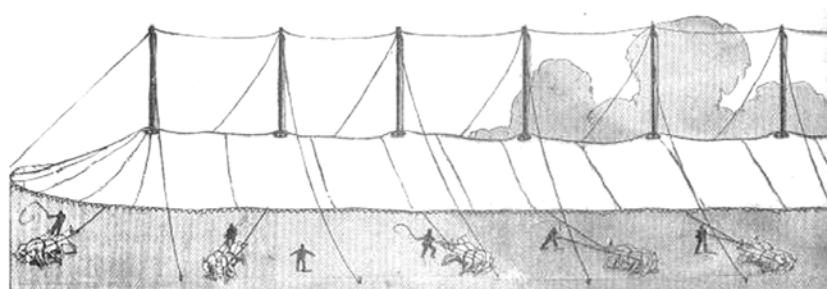
**Driving stakes and setting up the center pole of the tent**



**Center pole in place, remaining poles are hoisted into place.**



**Sections of canvas are unrolled, laced together and poles secured to stakes**



**The enormous piece of canvas rises to the top of the poles**

Figure 7: Diagram explaining the step-by-step process of erecting a big top.

## The Fun Palace (1964), Cedric Price

There may never be an architect who has had such rich and radical opinions on the overlap of education and recreation, as Cedric Price. The ideas demonstrated in his unbuilt projects, the *Fun Palace* (1964) and the *Potteries Thinkbelt* (1966) serve as an important reference to the discussion around the rethinking of both learning and recreation. Price himself believed that it was,

*“essential to eliminate [the] unreal division between leisure and work time”.<sup>1</sup>*

Price's concern for the serious social and economic issues of his time, as well as his deep found respect for technology as a means to address these issues, was also very evident in his work. The Fun Palace was a project that came about as a response to Britain's great 'Brain Drain' during the 1950s –60s. This period occurred at the decline of the industrial age. Britain found itself ill prepared for the advancement in technology and change in the global market. As a result its most highly qualified engineers, scientists and technologists left Britain to find work in other parts of Europe, Asia and the United States. This meant that many 'semi-skilled' and 'unskilled' workers were left unemployed. The decrease of industrial activity also meant a reduction in the length of time of the average work week, a trend that was only expected to further decrease. It was predicted that over the following years Britain's economy would become more and more leisure based as people looked for ways to fill new found free time.<sup>2</sup> Furthermore, as psychiatrist Morris Carstairs lamented, the British educational system failed to,

*equip the ordinary man with the wish, or the ability, to go on learning for himself.<sup>3</sup>*

The project came about from an idea proposed to

Price by theatre producer, Joan Littlewood, and was an attempt to create economic opportunity for unemployed workers, through technology related activities of work and play. Artisans and tradespeople would be given the space and resources to both play with, and develop technologies at leisure. It was also seen as a means to allow for the training and the education of workers through engagement with technology. In its appearance, the Fun Palace could be viewed as a sort of 'anti-architecture'. It was more of a matrix onto which various functions and programmes could be added or removed. Price's faith in technology was particularly evident in this project. He chose to incorporate systems like *cybernetics* and *game theory*, (both emerging technologies of his time), as well as principles of *technological changeability*, *social participation and improvisation*. This would allow the architecture to adapt as the needs of its users, and the demands of technology changed.

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1 Cedric Price, *Planning and Pleasure – Cedric Price: Works II*. (London: Architectural Association, 1984), 61.

2 Matthews, *From Agit-Prop to Free Space: The Architecture of Cedric Price*.<sup>12</sup>

3 Morris Carstairs *Reith Lectures*. BBC. 1962

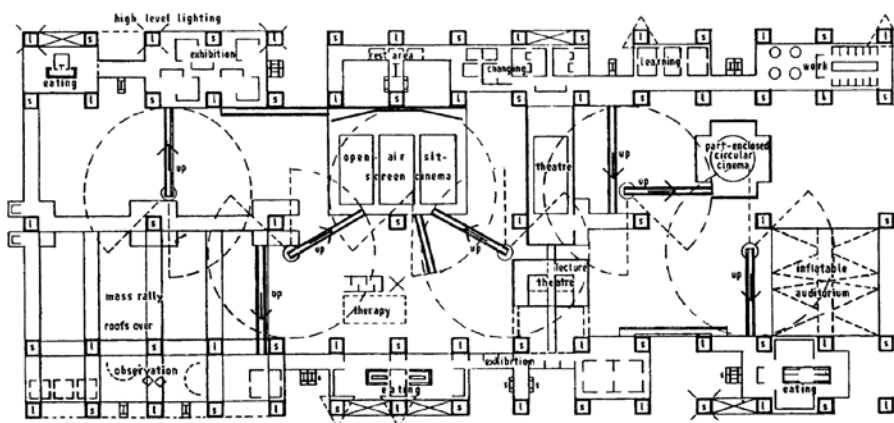
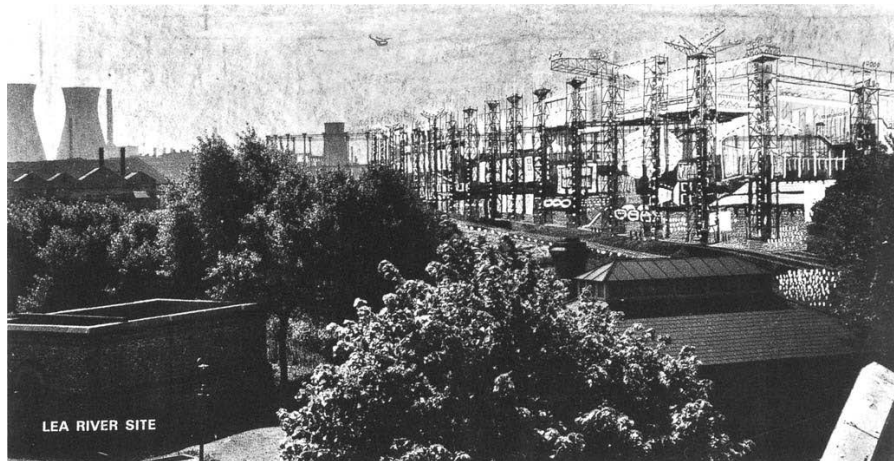
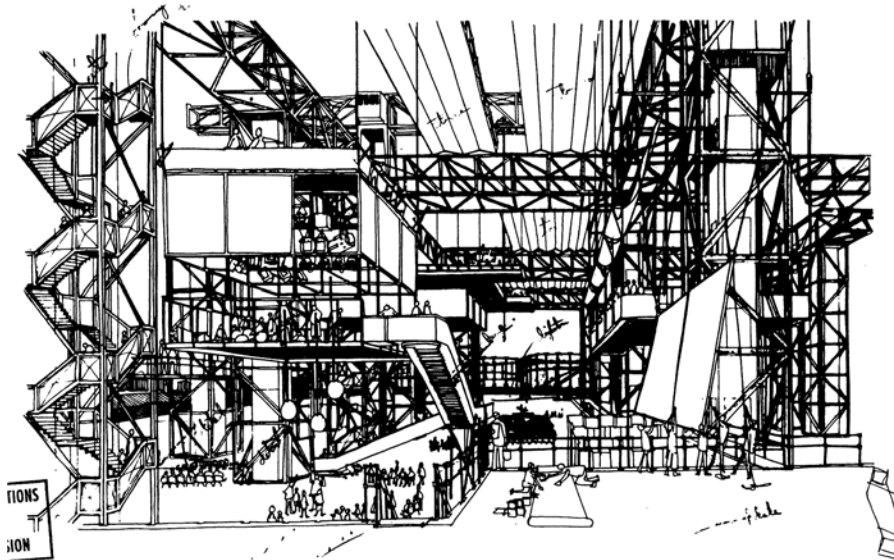


Figure 8: (top): Internal view of the Fun Palace showing the moveable systems of circulation and almost machine like interior.

Figure 9: (centre): External view of the project in its intended context. The skeletal appearance of the building makes it seem like an uncompleted structure.

Figure 10: (bottom): Floor plan of the Fun Palace depicting the cranes which would lift up and move equipment, floor planes and circulatory elements in the building. These mechanisms allowed the Fun Palace to be completely adaptable.

## Principle 2: Learning Through Making

With all these new ways to ingest information very little of it actually gets digested and assimilated into a working body of knowledge for those who consume it. In a world of readily available information and fast emerging technologies it is possible to learn about them all, and at the same time, possible to miss actual engagement with them. This is the paradox of the modern situation, but it is also a paradox that has become increasingly true as even our technologies of learning develop. Engaging with making often goes hand-in-hand with engaging with others. The information age has given us so many ways to access information, but as mentioned before, it also further separates us from one another. As noted by Berman,

*[...] modernity can be said to unite all mankind. But it is a paradoxical unity, a unity of disunity; it pours us all into a maelstrom of perpetual disintegration and renewal, of struggle and contradiction, of ambiguity and anguish.<sup>1</sup>*

Those who wish to develop a foothold in technological thinking often are better served learning closely from those with more experience. It is no wonder that the learning of practical trades often start in apprenticeship. The vastness of technology often requires the guidance and mentoring of those who are better acquainted with it. This dissertation explores the potential for such engagement to serve as an incubator for new ways of learning.

This dissertation lauds *making* as a means of understanding and developing technological thinking. It proposes learning through a process of boundary pushing and the technological innovation.

### Repair Cafés

In our age of consumerism it is common place for us to replace our broken appliances with new ones,

the moment they malfunction. This is often the case even if we do not know what caused them to malfunction in the first place. *Repair Café International* is an organisation that attempts to reduce the amount of electronic waste we produce, whilst teaching people how their everyday appliances work. Events are held across the world, in town halls, school classroom and restaurants. Members of the public are welcomed to bring their broken appliances and electronics, and can assist 'fixers' who volunteer their expertise and knowledge, in fixing them.<sup>2</sup> When most people consider education, what comes to mind of course is the traditional model of a 'teacher' and 'learners'. There is a single direction of focus from the body of students, towards the teacher, and thus teaching is limited to originating from only that source. With ideas like the Repair Cafés, the public have a vested interest in their own learning, but are also able to generate their own learning through a hands-on process. It becomes a sort of short-term apprenticeship where the everyday man on the street can come into a space and learn from those with existing technical knowledge.

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1 Marshall Berman. (1982) *All That is Solid Melts into Air: The Experience of Modernity*. New York: Penguin Books

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2 Repair Café International, "About Repair Café". Repair Café International. <http://repaircafe.org/about-repair-cafe/> (Accessed April, 15th, 2014)





Figure 11: A photo of repairs being done at the Stichting Repair Cafe, in Amsterdam.

### **The Potteries Thinkbelt (1966), Cedric Price**

The Potteries Thinkbelt allowed Price to further explore ideas uncovered during the Fun Palace project. The Thinkbelt was an adaptable framework for a network of different buildings which were superimposed on the dilapidated North Staffordshire Potteries. It was anchored by three key 'transfer areas' which each served different purposes within the project. These areas of exchange formed a framework in between which mobile classrooms, resources, specialised equipment and even living quarters for students could be transferred or shared. Price saw the Thinkbelt as a means to bring about urban and industrial revitalisation in towns which had become wastelands after the fall of the industrial age. Existing buildings, infrastructure, roads and railways were re-incorporated in a new master plan.<sup>1</sup> New educational uses intermingled with, and revived existing industrial uses. The new was able to set up a dialogue with the old in a way that could benefit both. Price believed that new urban development opportunities could be realised through the 'industry' of education

Like the Fun Palace, its buildings were also not 'buildings' in a traditional sense but rather structures that adapted, as technology changed. Though it also sought to emphasise opportunities for play and learning, its overarching function was to create opportunity for self-propelled learning.<sup>2</sup> Price sought to breakdown the divisions that existed between the education of theoretical and the education of practical sciences.<sup>3</sup> He believed that current systems of education had failed in that they only served to further enforce the disparity between existing economic classes. Perhaps these same divisions could be said to exist in our own context. In the South African higher education system there are very apparent differences between Universities and Technikons (or Universities

of Technology as they are known today). While Universities often focus on the creative development of new ideas or theory, Technikons tend to focus on the education of knowledge and skills for practical application. As discussed by Chris Hamnett, polarisation of professional industries and practical trades can serve to cause vast differences in the compensation individuals working in each are likely to receive. These difference can in turn effect the way society values or undervalues these industries.<sup>4</sup> It is my opinion that the polarisation of theoretical and practical education often leads to an under-appreciation of practical training (and trades). Not only this, but also an underestimating of what can be achieved through a practical education. I would argue that a model of education, that combines both practical training, and creative innovation would both; boost the way we value artisanal industries, and foster a environment where technological innovation is commonplace.

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1 Samantha Hardingham Potteries Thinkbelt: A City Caused by Learning. (Lecture), (Light House Gallery, September 2011)

2 Samantha Hardingham Potteries Thinkbelt: A City Caused by Learning. (Lecture), (Light House Gallery, September 2011)

3 Matthews, From Agit-Prop to Free Space: The Architecture of Cedric Price. p. 196

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4 Chris Hamnett, "Social Polarisation in Global Cities: Theory and Evidence", Urban Studies 31 (3), 1994 401-424





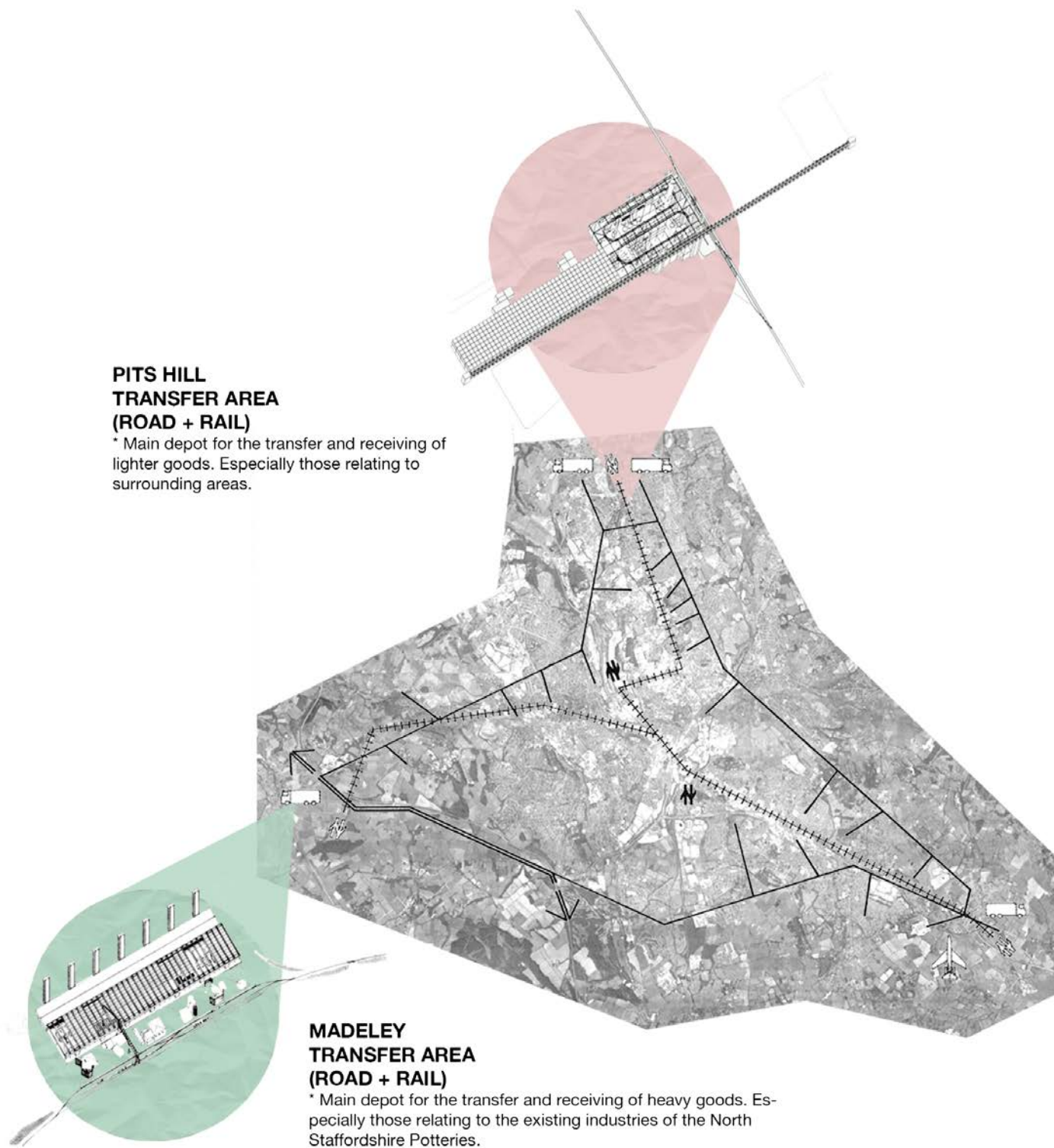
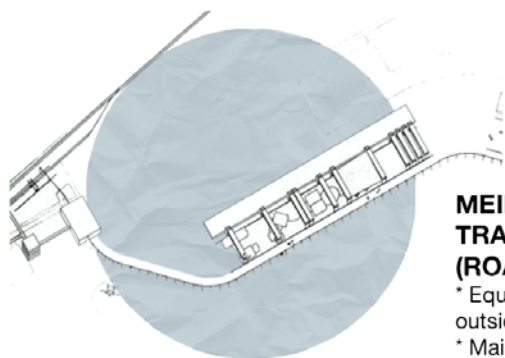


Figure 14: Diagram showing the three key Transfer areas, and purposes of each.



**MEIR  
TRANSFER AREA  
(ROAD + RAIL + AIR)**

\* Equiped with an air strip for the intergration of the Thinkbelt with the outside world.

\* Main depot for the international transfer and receiving of lighter goods. Especially those going to far off places which would need to be transported by air.

\* Also would be equiped with mechanisms which would allow for the sharing and transfer of information wirelessly (this in a time which preceeded the internet).

## Principle 3: Didactic Technology

In man's endeavours to optimise the 'tool', technology has become more sophisticated. To ensure that the functionality of the tool integrates seamlessly into our lives, its inner workings are hidden so as not to be an obstruction. Everything is masked and we are no longer required to even think about the manner in which our devices and machines operate. This is the state of our current valuation of technology. The idea of didactic technology is to develop technology in such a way that it lends itself to being understood by man.

### The Hybrid System

*Hybgrid* is a technological system with architectural ramifications. The project was developed by a multidisciplinary team comprising the AA Emerging Technologies and Design Department, and The AA Architectural Association. Software was designed to consider the nature of the joinery in the system. Through adjustments of the dependent variables at each individual connection, changes in the overall structure could be predicted. As explained by its design team,

*This research project focused on developing a design method of form finding in which the overall shape results from the behavioural tendencies and local actuation of interconnected elements[...] in this case simple threaded rods, allows for changing the curvature of the element.<sup>1</sup>*

Although it was developed using mathematical algorithms and specially developed software, it is based on very simple principles. It is essentially a clever way of connecting three strips of material, and parametrising its joints so as to be *programmable*. The genius of the Hybrid system is that it is simple enough to be

inherently understood by most people. A person who is untrained in the computation of its form could still make adjustments to the structure by hand, in order to achieve an expected change in the shape of the entire system. Not only this, but such a user could, through making adjustments, further understand the 'science' behind the making of such a system. Something produced through computation and scientific method can thus be partially understood at first sight, but through engagement be further appreciated.

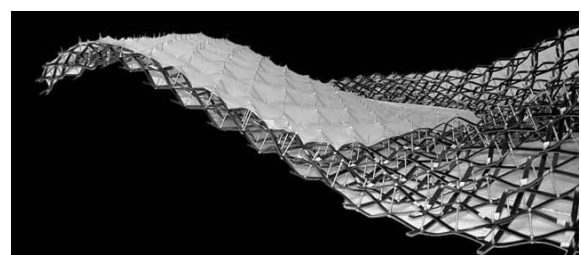
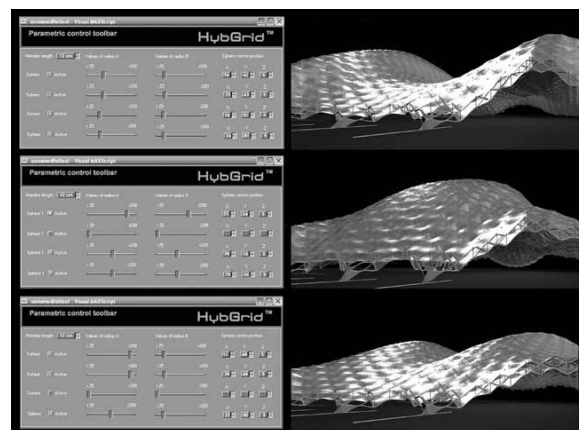
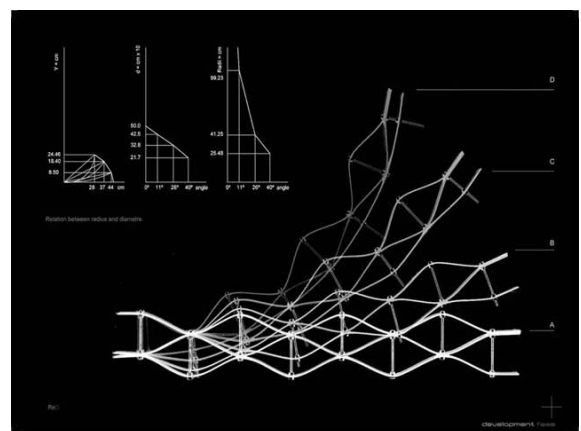


Figure 15: Digital simulations and studies done by the design team during the development of the system.

1 Prof. Achim Menges, "Hybgrid", Achimmenges.net, <http://www.achimmenges.net/?p=4407>, (Accessed: February, 19, 2014)





Figure 16: Photo of the Hybgrid system being used in a matrix to form a roof-like structure.



## *Section 3*

### *The Project*

The principles gleaned from the various reference points provided important ideas to what a new model for the education of technology could look like. The following section discusses the interpretation of these principles, and how they have been developed into an architectural project.

## The Development of a New Typology

During the study of the work of Cedric Price, the search for flexibility in architecture became an interesting reference point. For Price, centres of technology needed to be adaptable since he understood that there was no way of foreseeing what the demands of technology would be five, or even ten years, after his projects were to be completed. The idea of adaptability in architecture could however serve another purpose in the search for didactic opportunities in architecture. The studies done in the development of the Hybgrid system proved this. Perhaps architectural structures could be adaptable to allow for the input of those who used it on a daily basis. From the beginning Chautauqua was an interesting discovery to this dissertation. It was a movement which historically was very powerful in evoking curiosity within society regarding the inner workings of technology; despite the temporality of its spatial manifestations. Since it manifested itself as a portable movement, it could reach areas a fixed building could not. The process of setup and breakdown which was required by it, also afforded interesting opportunities to directly involve the users of the structure in its erection; much like the way traditional barn raising requires the participation of entire farming communities. Thus the idea of separating the project into a 'mothership' and mobile 'satellites' came from early explorations of what didactic architecture could be. An architecture that allows room for its users to affect it. An impressionable architecture.

Interesting ideas began to emerge between the work of Cedric Price, and Chautauqua. These ideas related to changeability and mobility in the education of technology. It seemed obvious to me that the new typology should express itself in two different but interrelated attitudes. The first being A building that became interactive and second being a portable structure that could include its user in its setup.

### The Mothership

From the very beginning the headquarters for the project was thought of as a work/play space for *tech-fundis* where they would be able to learn from one another and also develop prototypes for emerging technologies they were interested in. Building users with tenure would have more private, workshop spaces, but everyone would share the use of specialised equipment. These areas of shared resources would thus become communal areas where idea sharing could occur. However sharing of knowledge would not only be limited to those with existing experience. There would also be opportunities for the layman to walk into the building and engage with these tech fundis. The Mothership would be a place that provoked the curiosity of the general public for the technological. A space where people with varying degrees of technological knowledge could interact. The example of Repair v showed that very often technically minded people were happy and willing to share their knowledge if there were parties interested in learning. The Mothership was thus also imagined as a space where people could learn from one another.



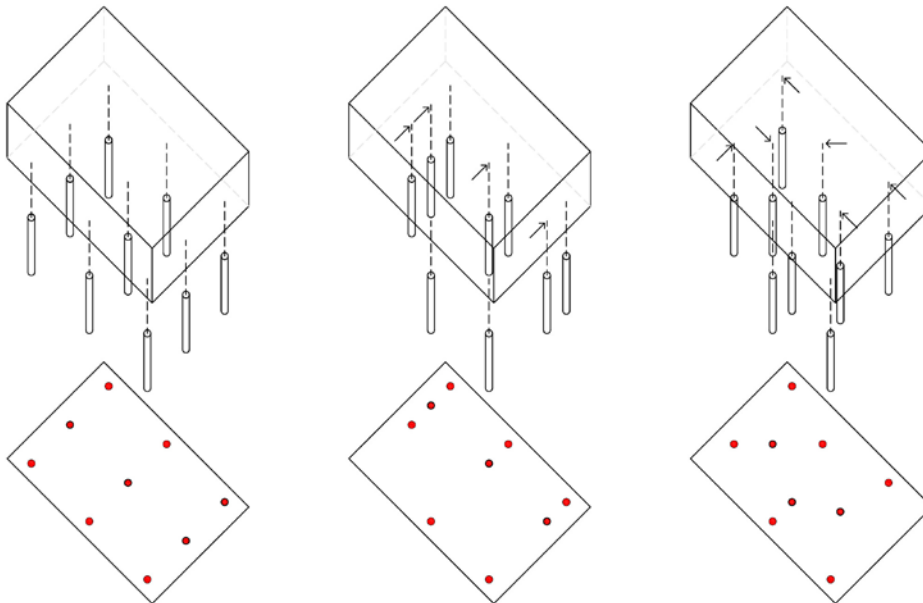
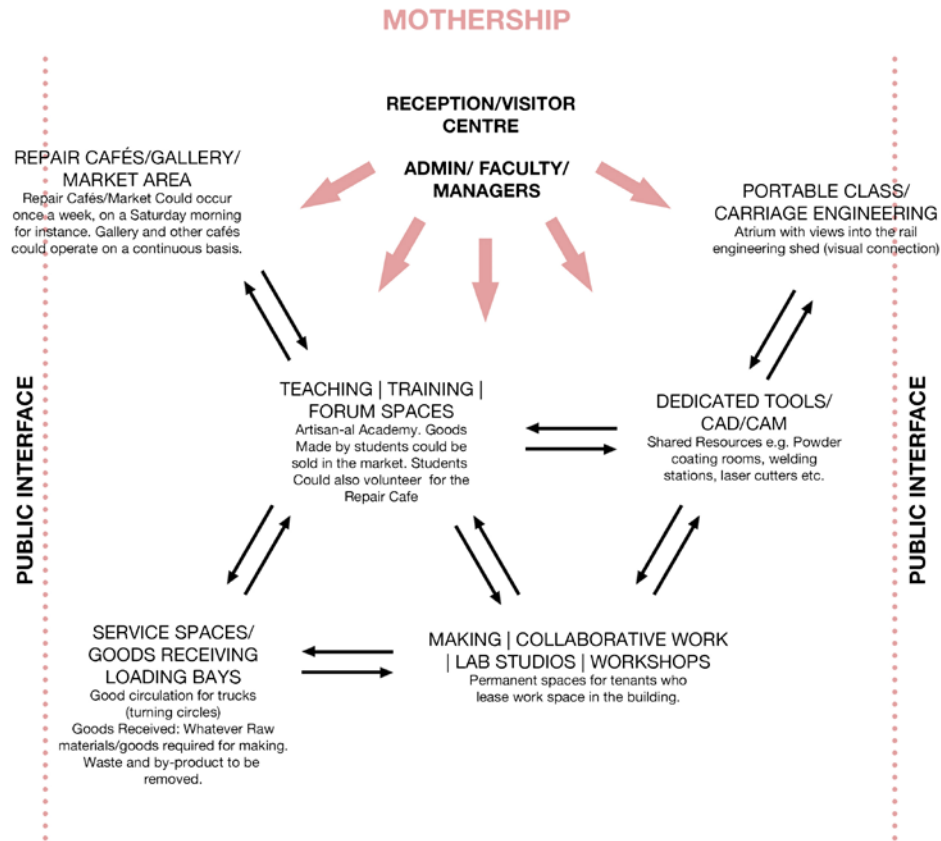


Figure 17 (top): Early ideas of the relationships between the various elements of the buildings programme.

Figure 18 (bottom): diagram depicting early ideas of structural adaptability for the Mothership.

## The Satellites

The Satellites would share the spirit or *DNA* of the Mothership in many ways. It would however use shorter term 'events' to propagate the education of technology in areas which the building could not reach. These Satellites could act as teaching resources, providing workshop space, equipment and machinery to towns that might not have access to these tools. The Satellite initiative could for instance, partner with local high schools, and provide equipment for special woodwork classes. The relationship between the Mothership and Satellites could also create possibilities for interconnectivity between the two. For instance special events and presentations which occurred in the Headquarters could also be broadcast in the Satellites, or vice versa.

A very important decision for the design of the Satellite units was of course its strategies of mobility. The rail network offered interesting opportunities for this purpose. It had played a very important role in the economic and infrastructural development of South Africa. However, despite its far reach across the country (20 000 km of track), more than two-thirds of South African rail lines are not used at all, or used very seldom. In addition to this rail still remains the most energy efficient means to transport heavy goods over far distances (up to four times more energy efficient than road transport). After studying the extent of the rail network across South Africa, it became apparent that a portable architecture which made use of rail, particularly the underutilised rail lines running through rural towns across the country, could be very viable. Since the development of the portable Satellites could occur on the site of the mothership, the constraints of the mechanisms of mobility for these units

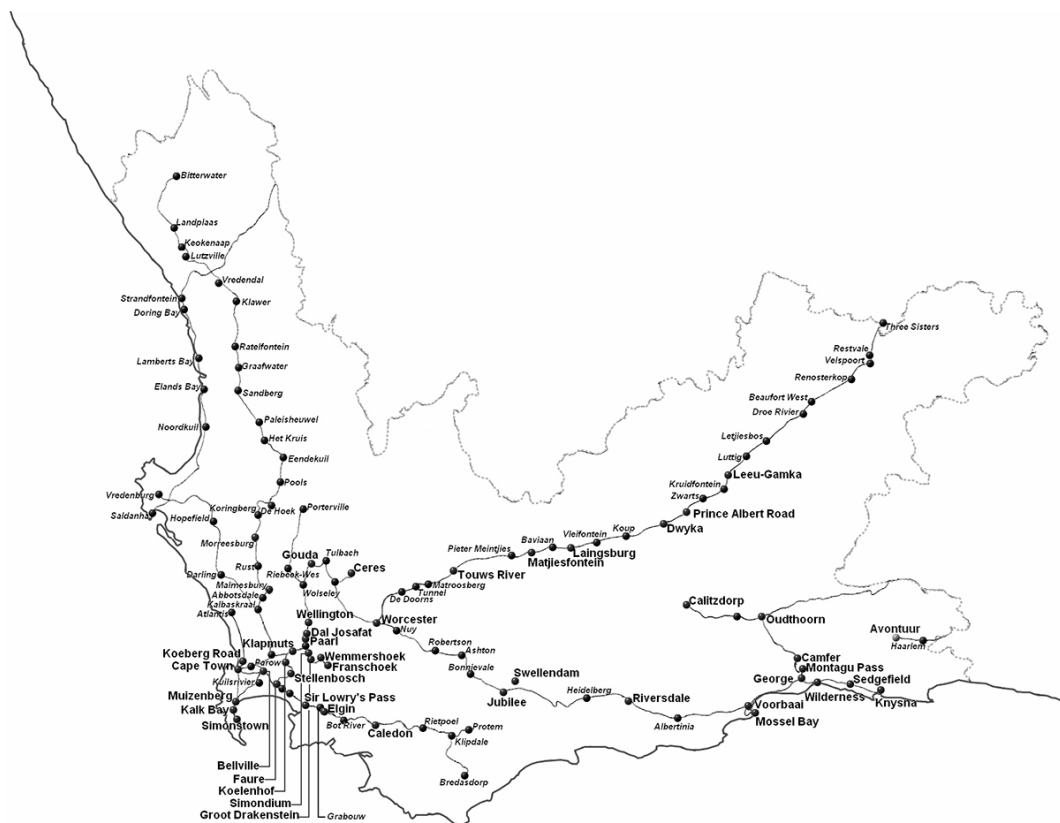


Figure 19: Map depicting the rail network across the Western Cape

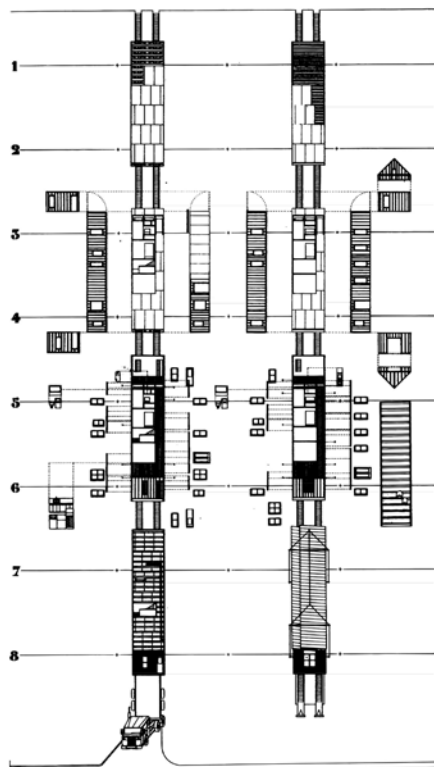


Figure 20: A progressive housing design by Abacus architecture. This was done for a competition where the winning design would be built by a mobile home manufacturer on a production line.



Figure 21: A mobile Chinese assault tower. This portable building follows a model where the architecture includes its own system for mobility, and is all-encompassing.

## Site Selection for the Mothership

The early programmatic ideas of this new, two-part typology immediately gave very specific cues as to what a site for the headquarters of this new model would look like. Initial choices considered sites which had privatised access to railway lines or sidings (whether functioning, or no not). As stated the project also sought to bring together those with existing technical expertise and those without such expertise. In the spirit of this, possible building users were imagined to range from heavy duty electricians to scholars for example. The building was thus imagined to be sited in close proximity to a combination of areas zoned for industrial, residential and even educational use. The site options were: a open parking area on the periphery of the Milnerton area, the North Link College at the Wingfield naval base in Goodwood, and areas around the Transnet Rail Yards in Bellville.

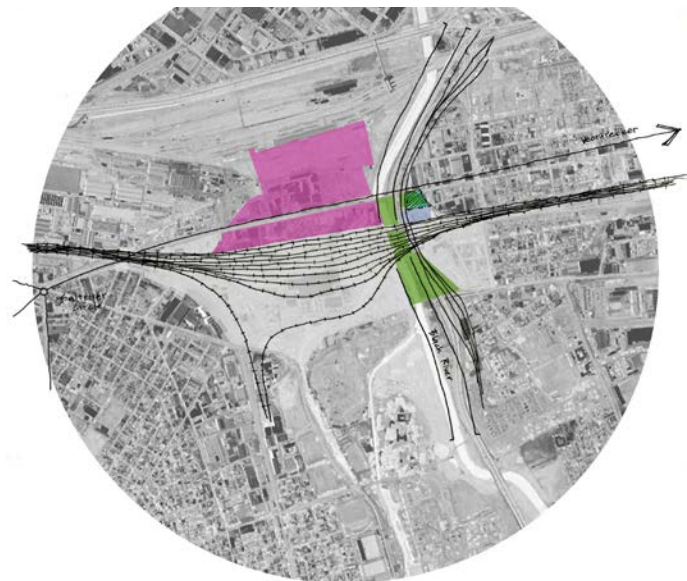
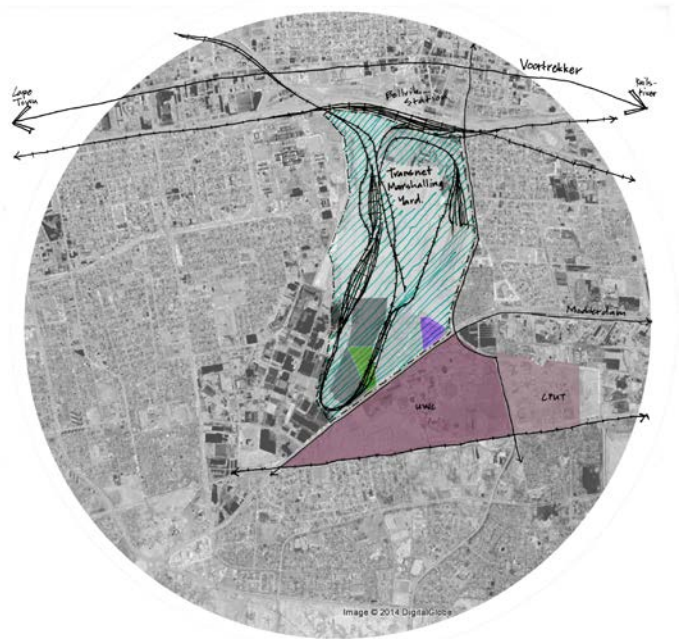
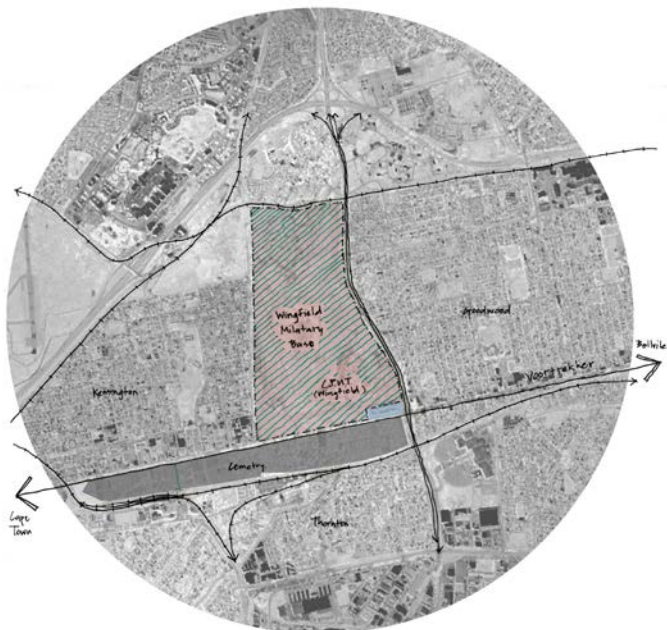


Figure 22: Study of initial site options.







However the project would ideally be of a smaller scale compared to these massive swathes of land. It also made sense for the mothership to be closer to the city; where the various rail lines originate. A second set of site options were then investigated. This included a vacant plot of land close to the Saltriver train station, a dilapidated wedge shaped building sitting between a set of rail lines and Albert Road in Woodstock, and a vacant plot of land next to an old rail siding, off of Lower Church Street, Woodstock. Between the three, the latter two were more prominently located and allowed for better access. The wedge shaped site was however very compact and perhaps too small for the intended programme. It was also located along the very congested Albert road, and foreseeable heavy goods delivery/loading needs would be hard to accommodate on this site.

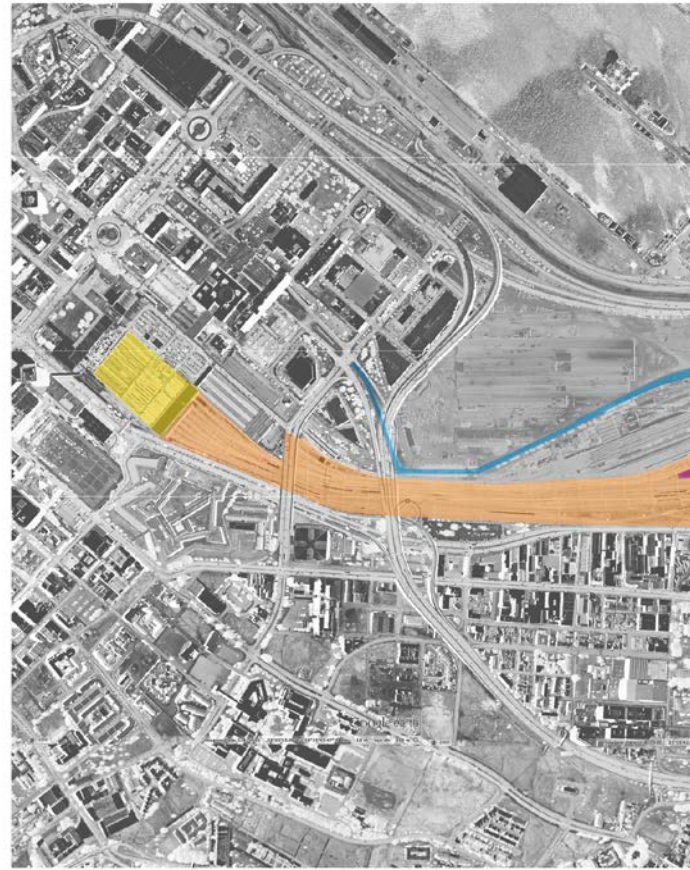
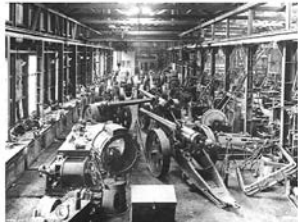
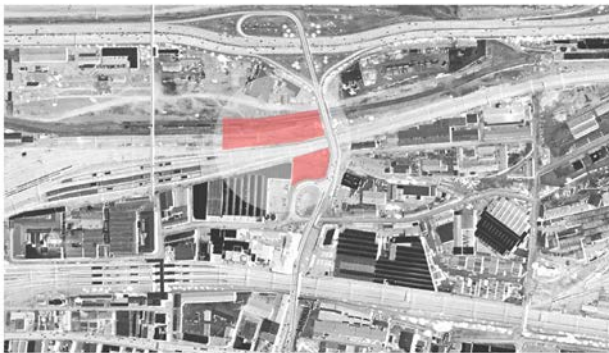
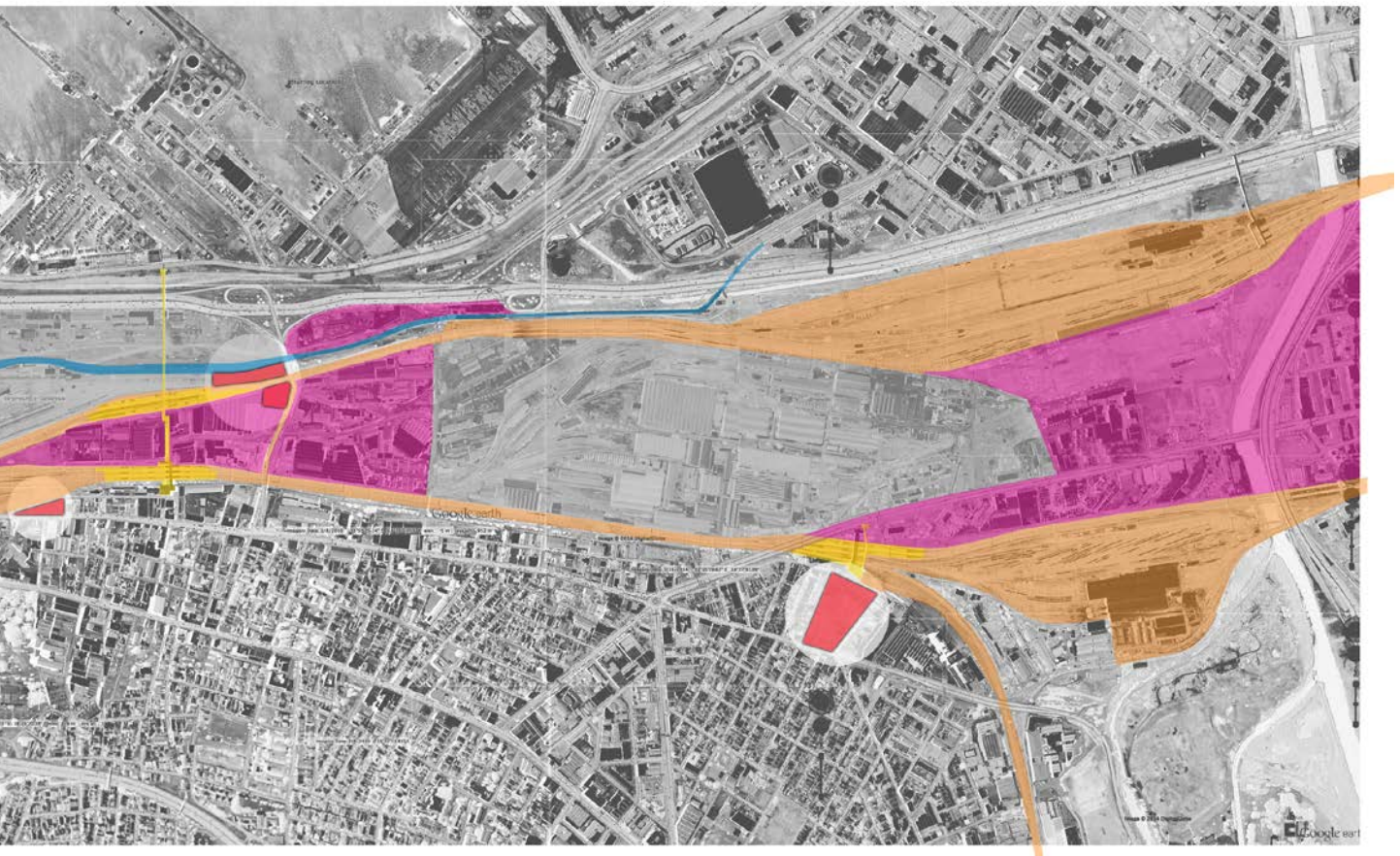


Figure 23: Second study of smaller, more centrally located site options







The Lower Church Street site thus became more favourable as it was in very close proximity to the N1 highway and existing public transport nodes. It was in walking distance from the center of the Woodstock mixed-use area, which combined residential (including schools), business and industrial building uses. There are also a number of interesting historic charges in the area of the site. The way the building was envisioned drew interesting comparisons to the Old Castle Brewery (an existing building in close proximity to the site). The Brewery was designed by New York architect, H. Steinman, and was placed next to the, at that time, new railway line into the city. The buildings South elevation was especially designed to be a sort of 'face' or advertisement of the Castle Beer company, that people would see as they neared the city by train. In a similar way, the Mothership was envisioned to be a billboard of sorts, for the promotion of technology. However, when it became less favourable for the company to produce beer in the city, the building became vacant. It ended up going through a number of retrofittings, as its ownership and use changed. At one stage it was even used as a cold storage facility for a meat company; a use that caused great damage to its building materials. It could thus be said that the buildings lifespan outlived its original intended use. The ideas of adaptability held for the design of the Mothership came from Cedric Price's understanding of time in architecture. As Price warned,

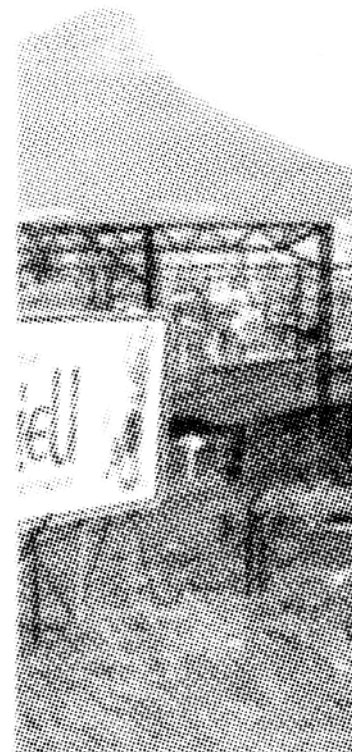
*But architects have to be wary of this because if their building falls out of use before it becomes refuse, you have misuse and disuse.<sup>1</sup>*

The ideas of adaptability meant that the mothership could adapt as the demands of new technologies changed. Of significance also is the sites close proximity to other historic rail engineering sheds in the area, and the rich history of industry in the Woodstock and Saltriver areas.

Figure 24: Aerial perspective looking towards the site.



Figure 25: Photo of the Old Castle Brewery taken during a time when the building was still used as a cold store.



<sup>1</sup> Cedric Price, "Time Architecture's Touchstone", in The Banham Lectures: Essays on Designing the Future, ed. Jeremy Ainsley & Harriet Atkinson. (Oxford: Berg Publishers, 2009)









Figure 26: View towards the site, for the pedestrian walking along the Lower Church Street overpass. The harsh condition of the sidewalk, which can be seen in the right of the photo, also leaves pedestrians vulnerable and exposed.





Figure 27: View towards the site, from just in front of the Old Castle Brewery, and towards the Lower Church Street overpass. The heights of the overpass can be seen in this photo.







Figure 28: View towards the site, from the Lower Church Street overpass. Although quite overgrown with vegetation, the rail siding can be seen running approximately in the centre of the photo.





## The Umfundisi Tech Centre - The Mothership

The array of building users, and the varying levels of security within the Centre meant that careful thought needed to be given to its spatial arrangement. The building sat adjacent to an overpass. A play in the buildings levels thus not only allowed the building to mediate the different ground heights, but also control how public, semi-private and private spaces could be mediated.

The earliest sketches portrayed the Centre's East (Lower Church Street) elevation as the most public edge of the building, with more private workshops, services and loading bays being concentrated on the West Elevation. The building was conceived as a sort of transparent shed of technological marvels and gadgetry that would stir the curiosity of passers-by. The shared making spaces and Visitors Centre would thus be located on the East edge of the building. A

pedestrian ramp would stretched from the My Citi shuttle/bicycle lane, North of the Rail way lines, to along the East Elevation would also bring pedestrians and cycles along this edge of the building. This was preferred over the existing condition where foot traffic is required to walk along the harsh Lower Church Street overpass to get to Albert Road. The portion of the building which handled rail engineering was to be the most secure, and also straddled the set of rail lines to the North of the Centre.

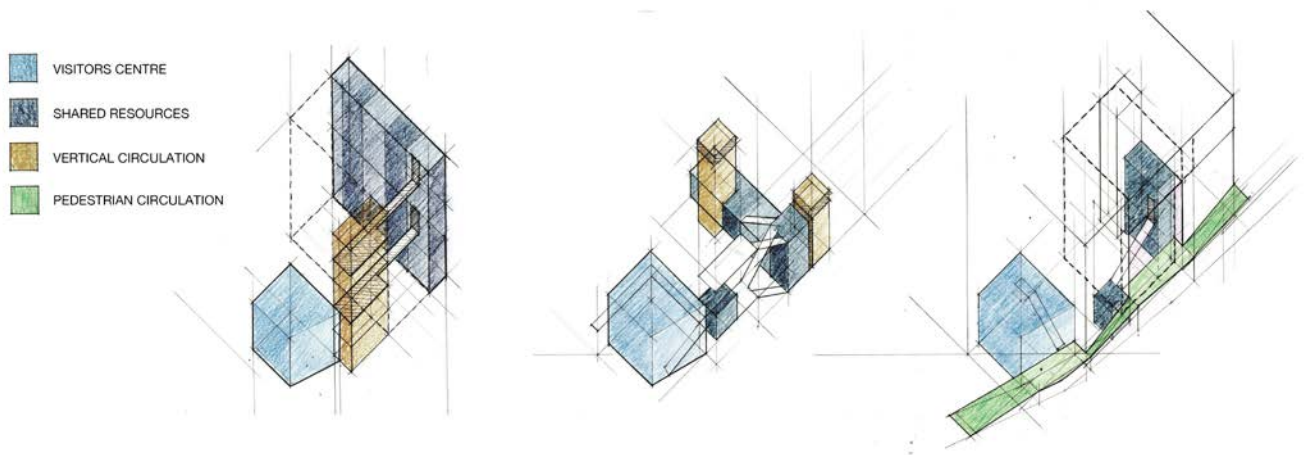


Figure 29: Early spatial configuration explorations of the pedestrian walk way could relate to the internal building.



- FOYER / VISITOR AREAS
- ADMINISTRATION CONTROLLED (OFFICES / GOODS RECEIVING)
- MAKING SPACES (STUDIOS / LABS / WORKSHOPS)
- CIRCULATION (PUBLIC / PRIVATE / SERVICE)
- PARKING / SERVICES

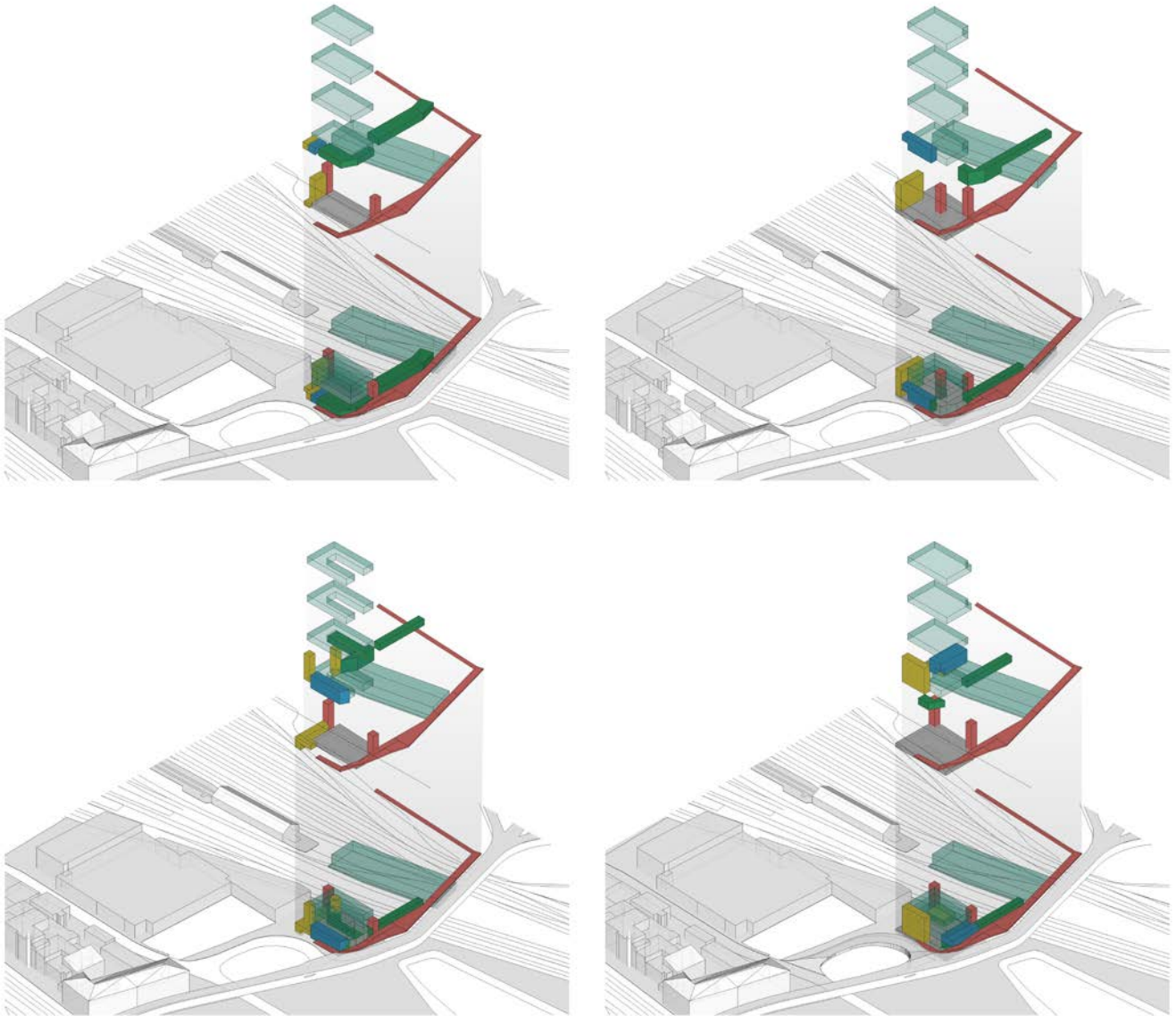
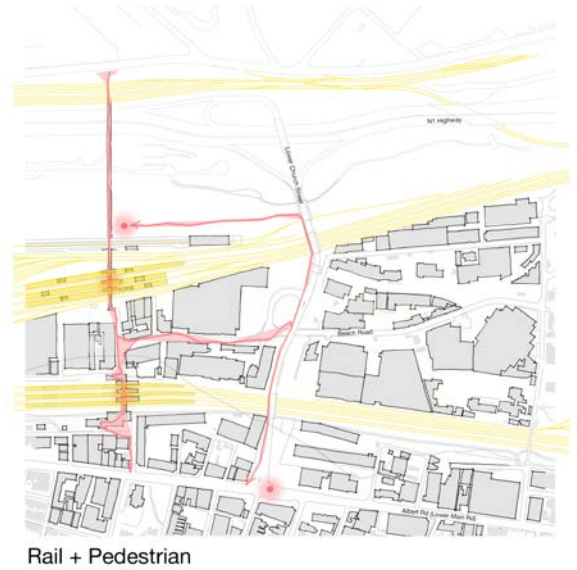


Figure 30: Spatial configurations options. Public areas are placed along the Lower Church Street Elevation. While making spaces are expressed as tall boxes which into which passers-by can gaze.

The existing vehicular off ramp leading to the building site (and its surrounding industrial precinct) also needed to be addressed. The junction, where the off-ramp from Lower Church Street meets with Beach Road, is at present very awkward. It also leaves a mass of land in its center to waste. Also the existing road layout often leaves delivery trucks which access this industrial area, backing up traffic waiting for an opportunity to turn. In light of this, the road layout for this area was

revised. As a result of the changed layout, the project could also make full use of its erven, and it was no longer necessary for the project entire set of rail lines, but instead just the old siding present on the site. This would also make it easier to directly deliver goods to the area where rail engineering would occur.

## Existing



## New



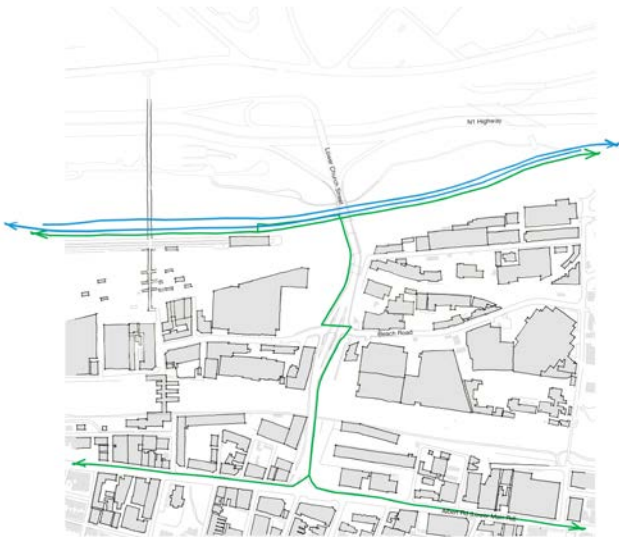
Figure 31: Movement studies of the area around the site with the existing and new road layout.



MyCiti + Cycling



MyCiti + Cycling



MyCiti + Cycling



Vehicles

After inserting a new road layout into the scheme, the buildings footprint changed drastically. Instead of the building straddling the entire rail line, it now only straddled a no longer used rail siding. The wasted space which had been locked in by the off ramp from Lower Church Street; together with the land of the off ramp itself, had now been made available.

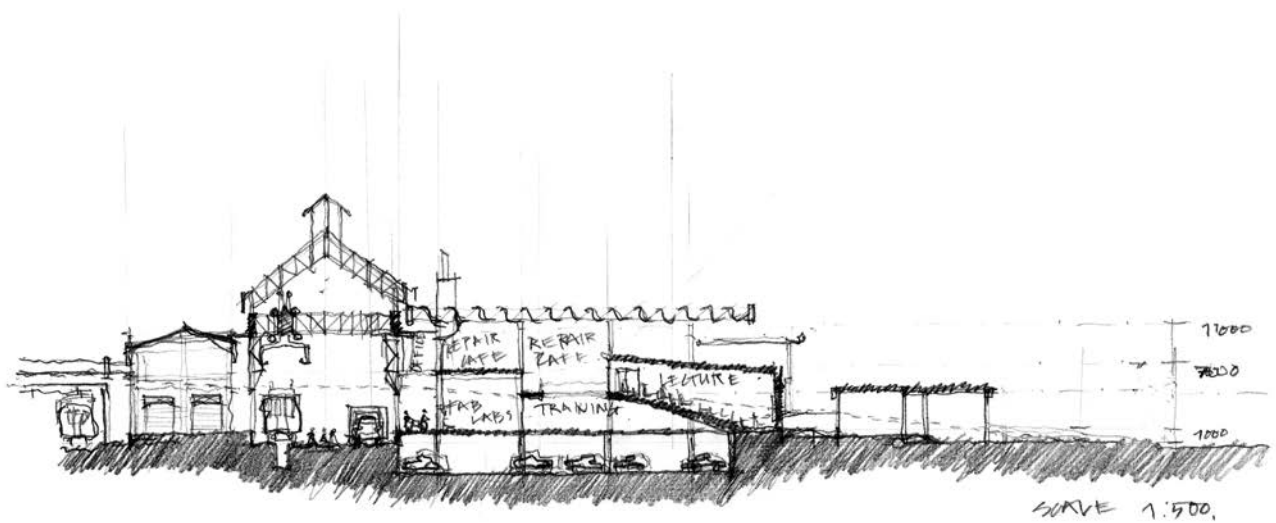


Figure 32: Section of early design, soon after the new road layout.



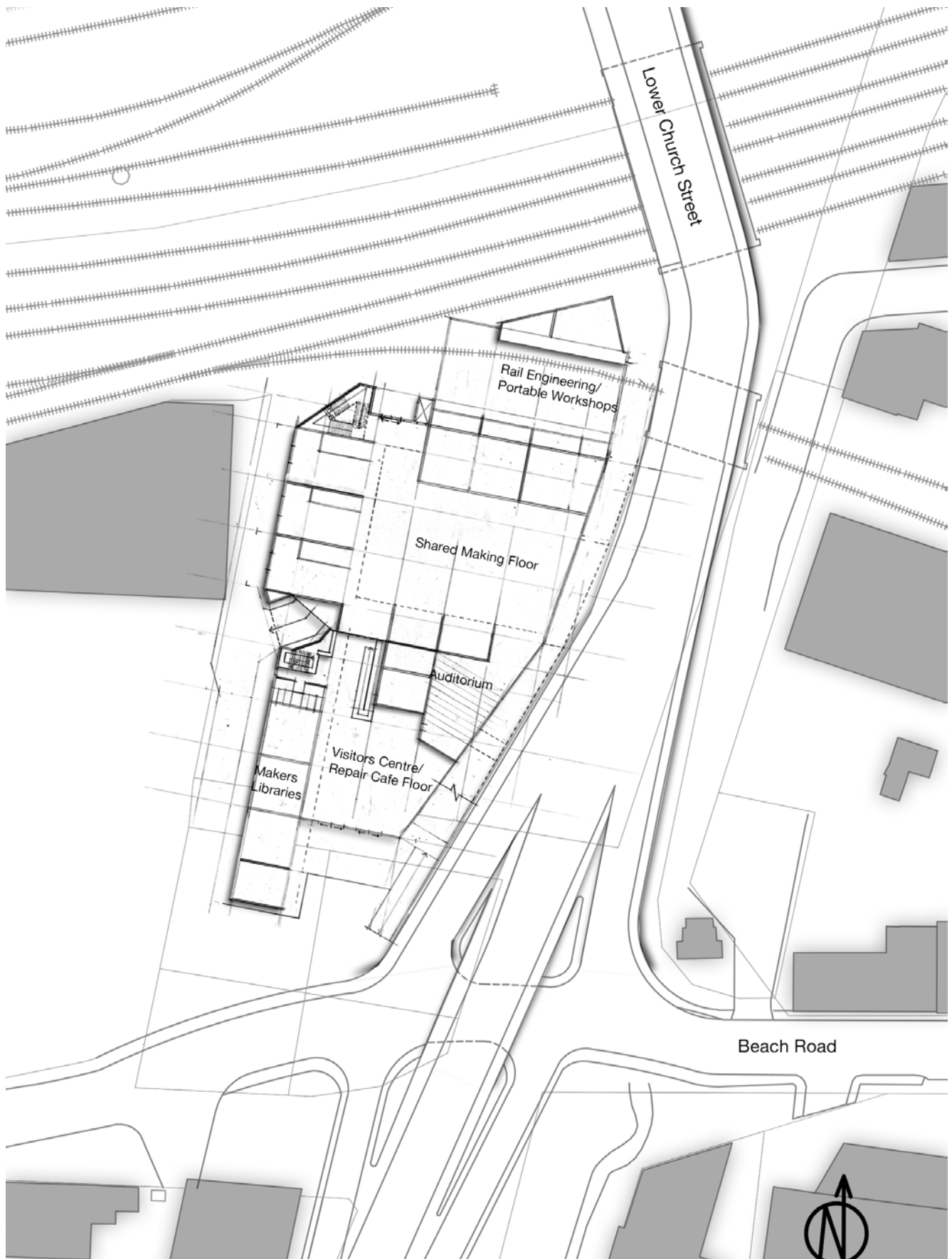


Figure 33: Plan of early design, soon after the new road layout.

As the project developed it became important to more clearly define the technology related activities which would constitute its programme. As discussed the spirit of the Institute is the showcasing, promotion and education of technology and technological thinking within society. It would need to cater for a variety of technologies at various levels of complexity.

- Repair Cafés would be the most easily of the buildings activities. People off the street could bring their broken appliances and electronics, and assist in the fixing of them with the help of experienced volunteers. These events could occur once a week, on a Saturday morning for instance.
- Visitor groups, like schools for instance, could be taken on guided tours around the Centre.
- The Centre would be the home to a new Fab Lab, a concept which makes Computer Aided Manufacturing (CAM) equipment available for the prototyping of ideas and academic use. The use of Fab Labs is free for individual provided that its use is not for profit and files are shared.
- Members of the public could enrol to a Artisan Academy, where they can learn particular trade skills. The methodology of the Academy not only comprises of practical skills training (as is the case with Technikons or Colleges) but also through research and creative innovation.
- Workshop/Laboratory/Studio spaces could be rented by tenants who host Makers Libraries. These Libraries are open work spaces which are accessible to the public, and are run by individuals with particular skills, knowledge and interests. They showcase the making of their work, host exhibitions and share collections of literature and media which relate to their particular field of interest. Makers Libraries would also form part of the guided tour programme.
- The most complex and private aspect of the building would be the Rail Engineering workshop. A team of expert makers who would be developing and building the portable, rail based Satellites.

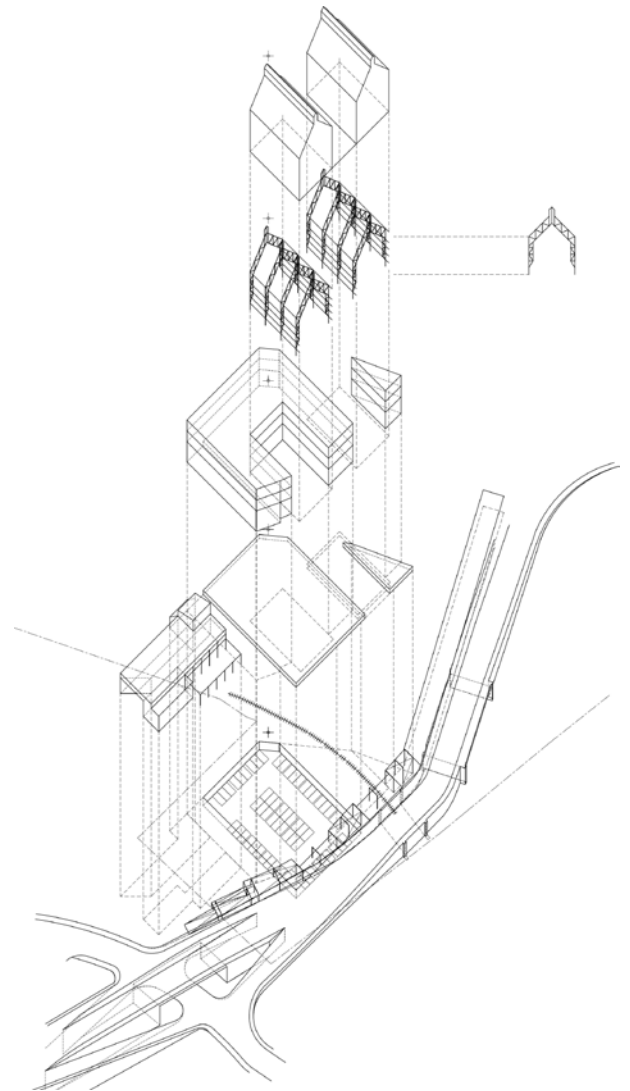


Figure 34: Exploded axonometric which explored how the buildings structure and programme could begin to relate.



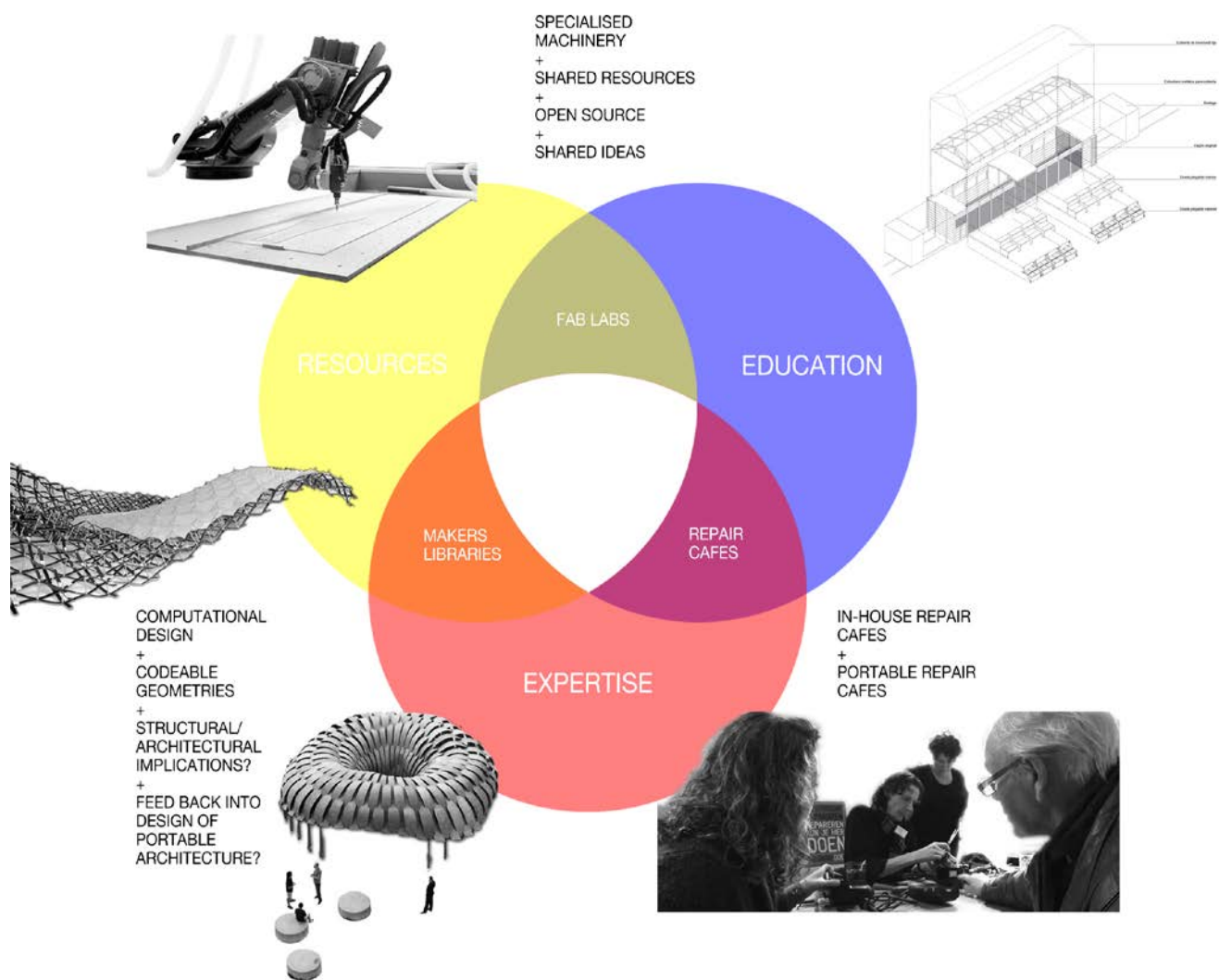


Figure 35: Graphic depicting the relationships between the various elements of the buildings programme.

## Draft A

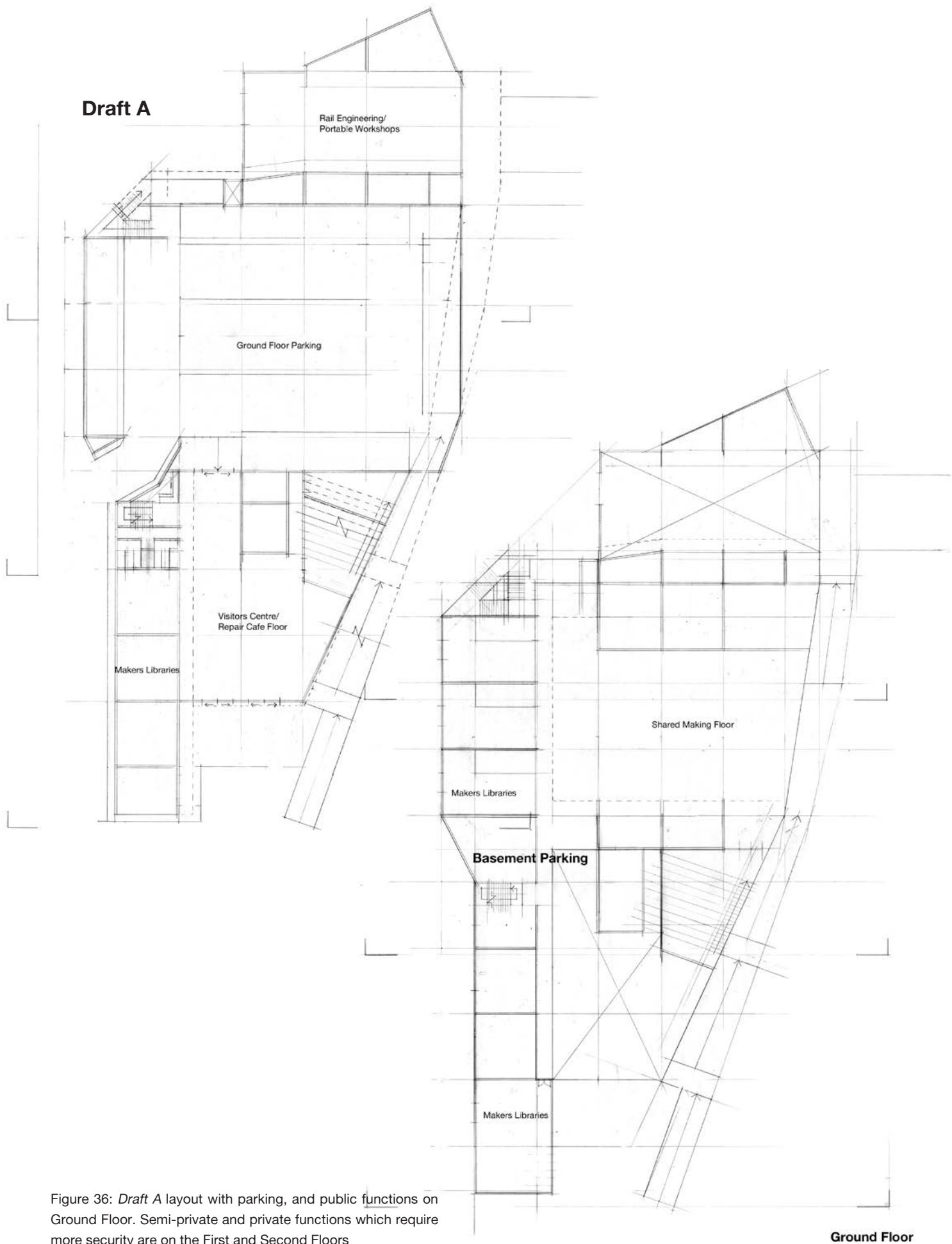
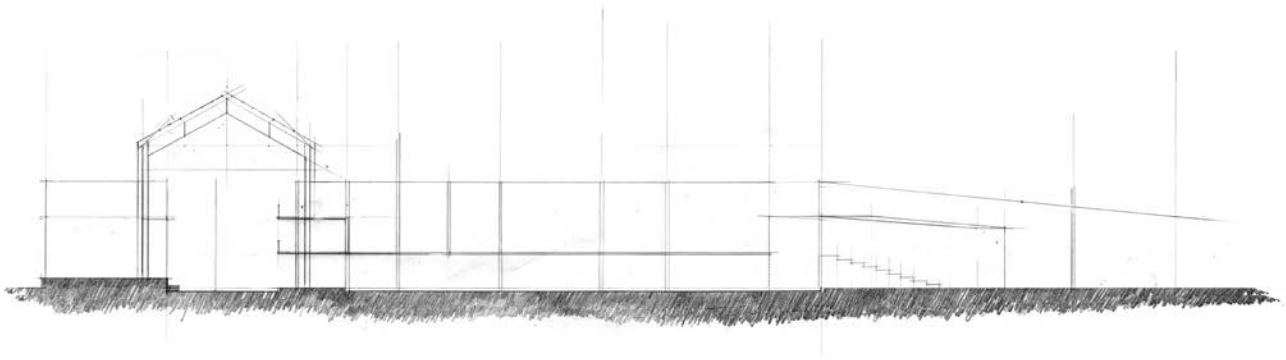


Figure 36: *Draft A* layout with parking, and public functions on Ground Floor. Semi-private and private functions which require more security are on the First and Second Floors



## Draft B

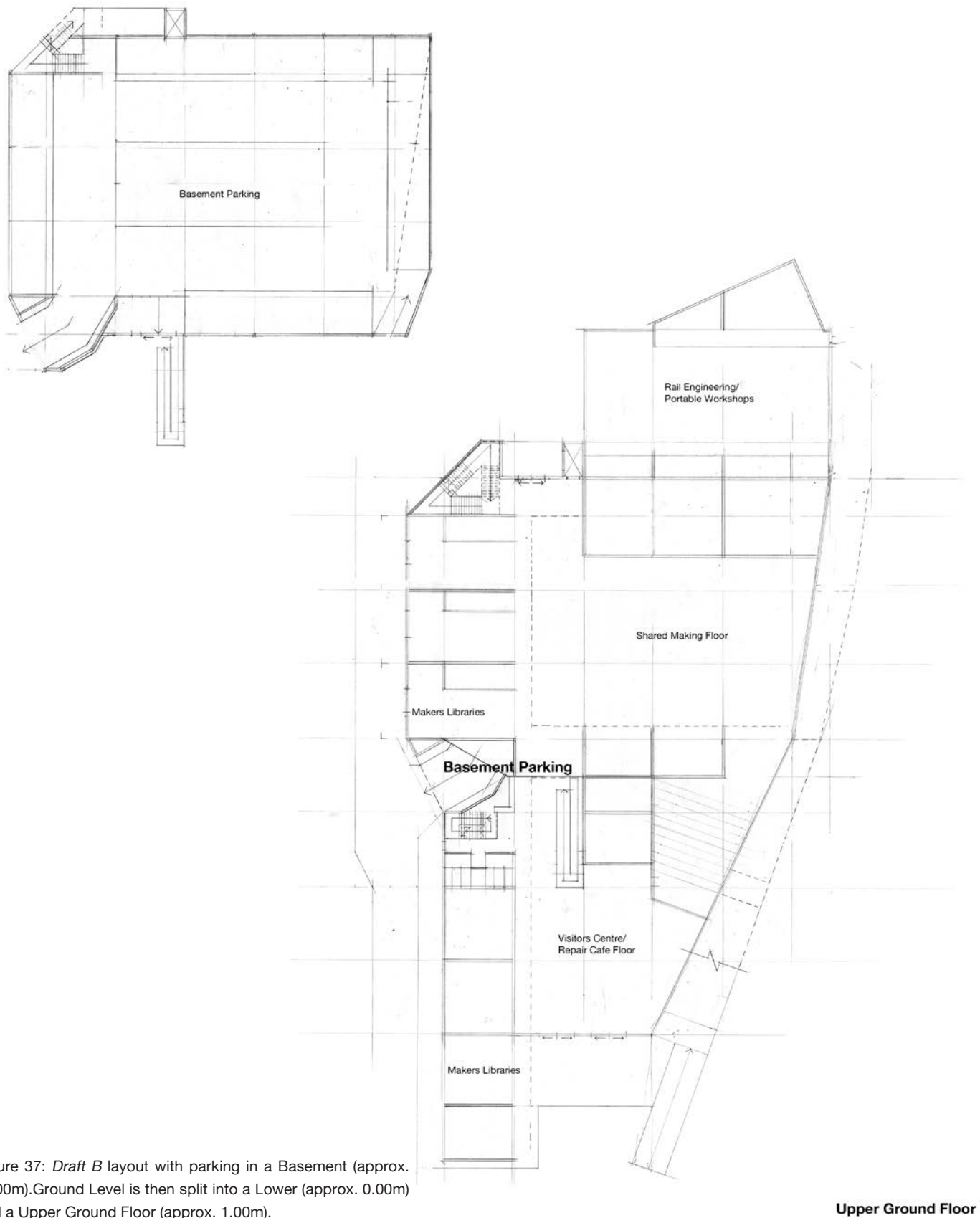
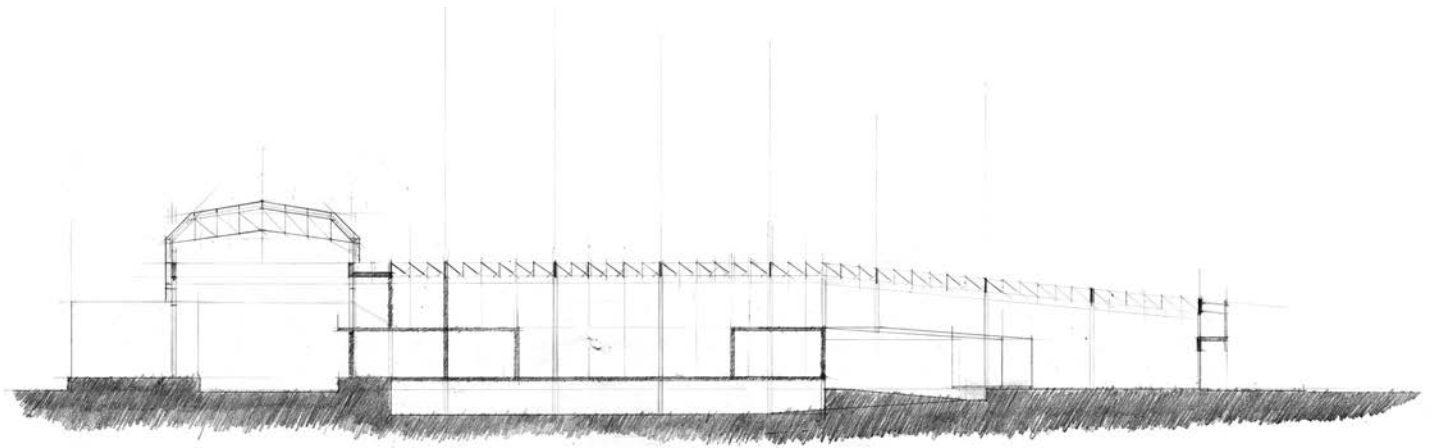
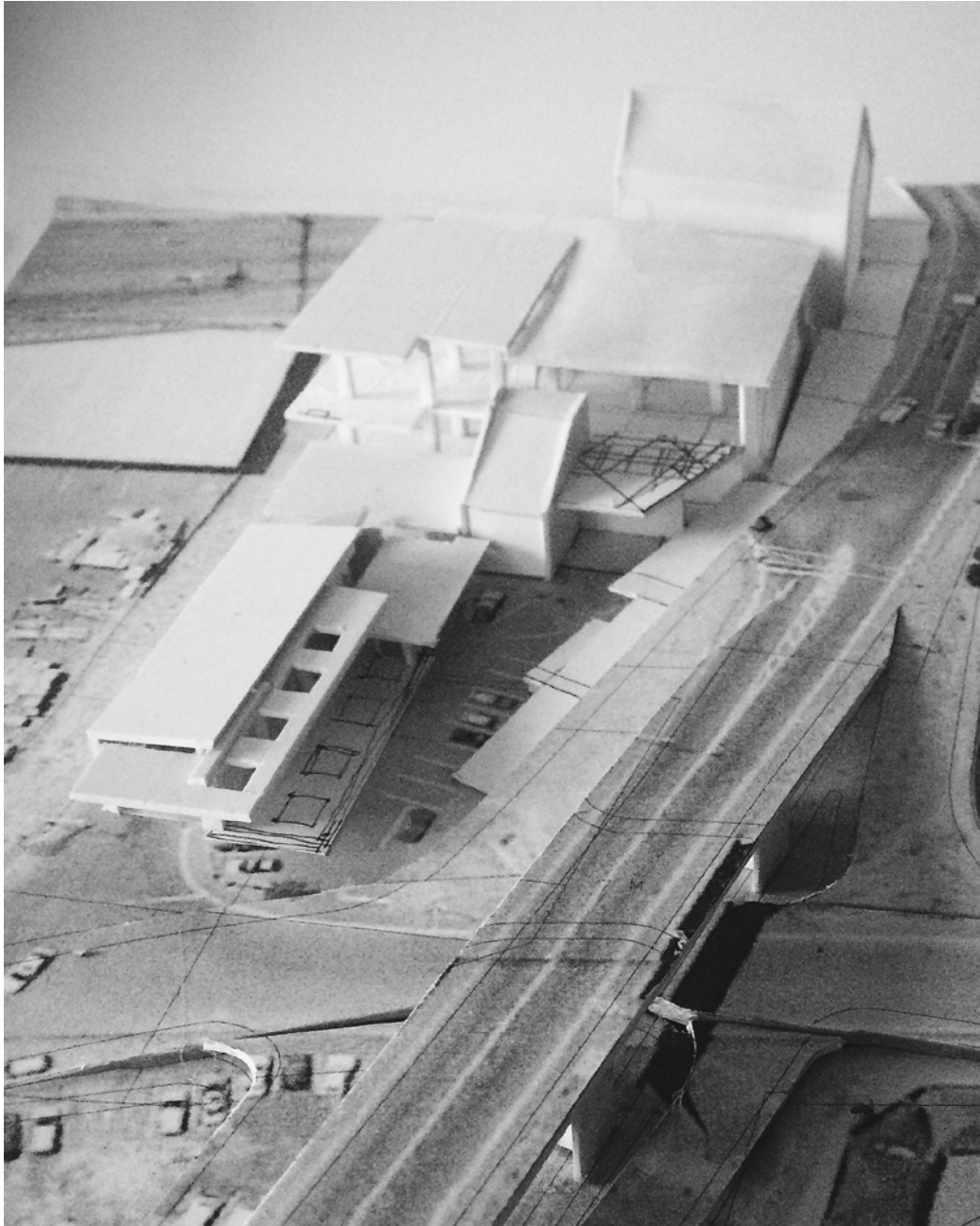


Figure 37: *Draft B* layout with parking in a Basement (approx. -2.00m). Ground Level is then split into a Lower (approx. 0.00m) and a Upper Ground Floor (approx. 1.00m).





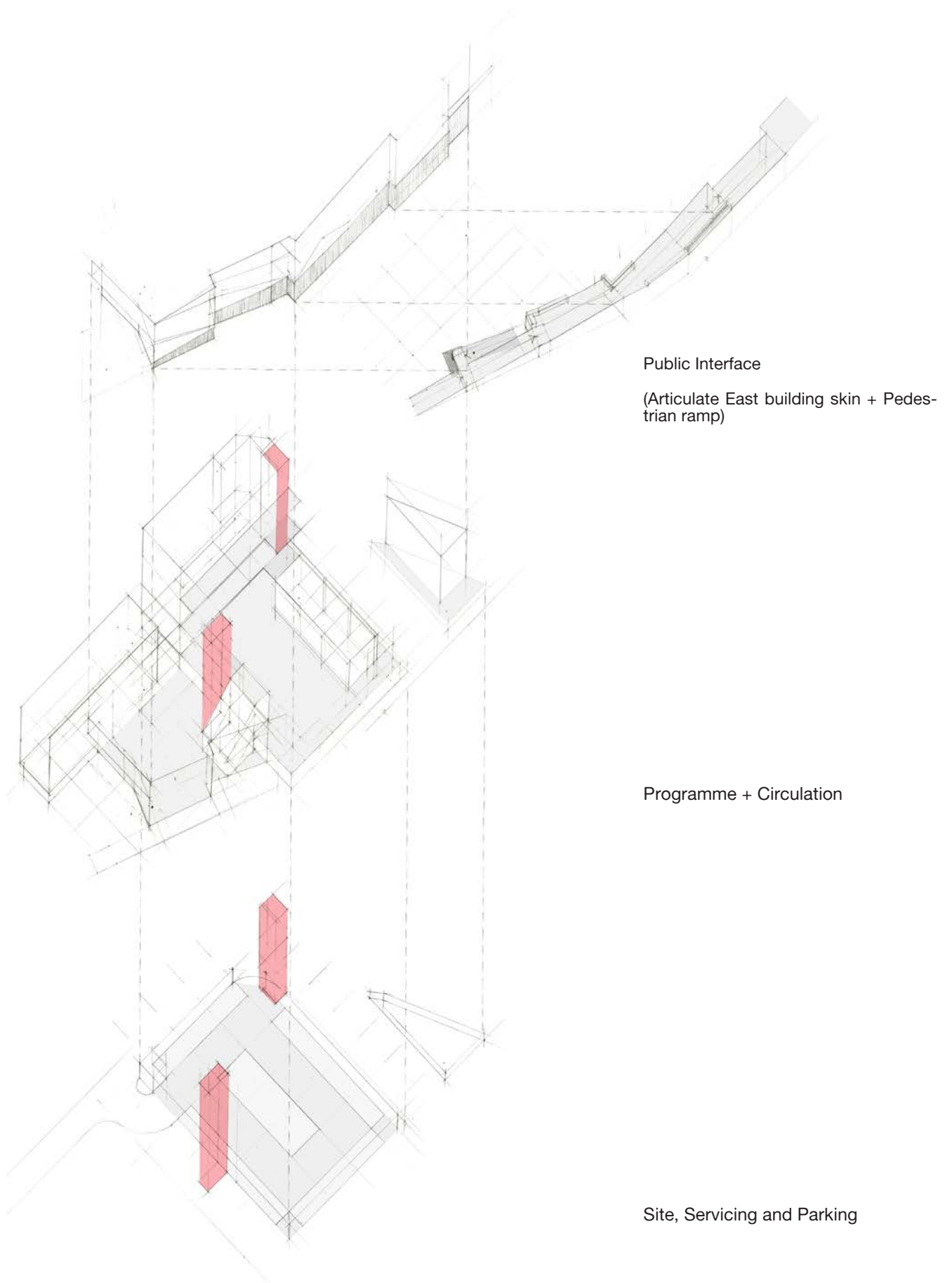
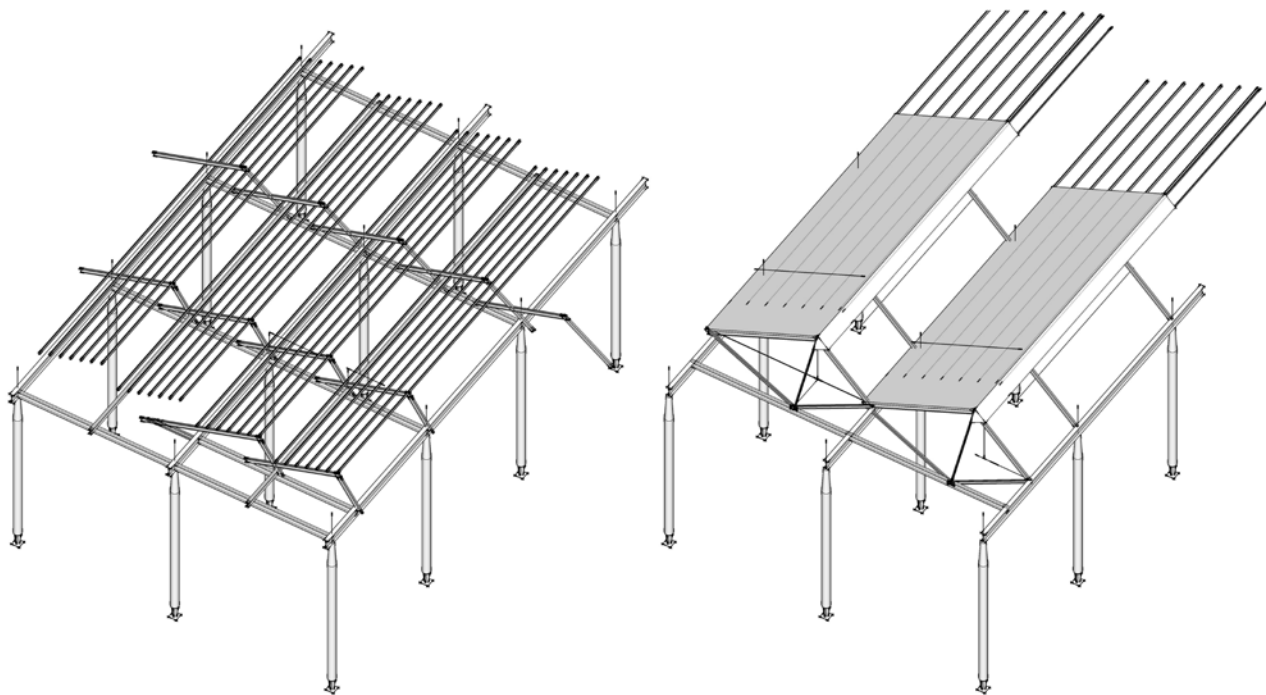
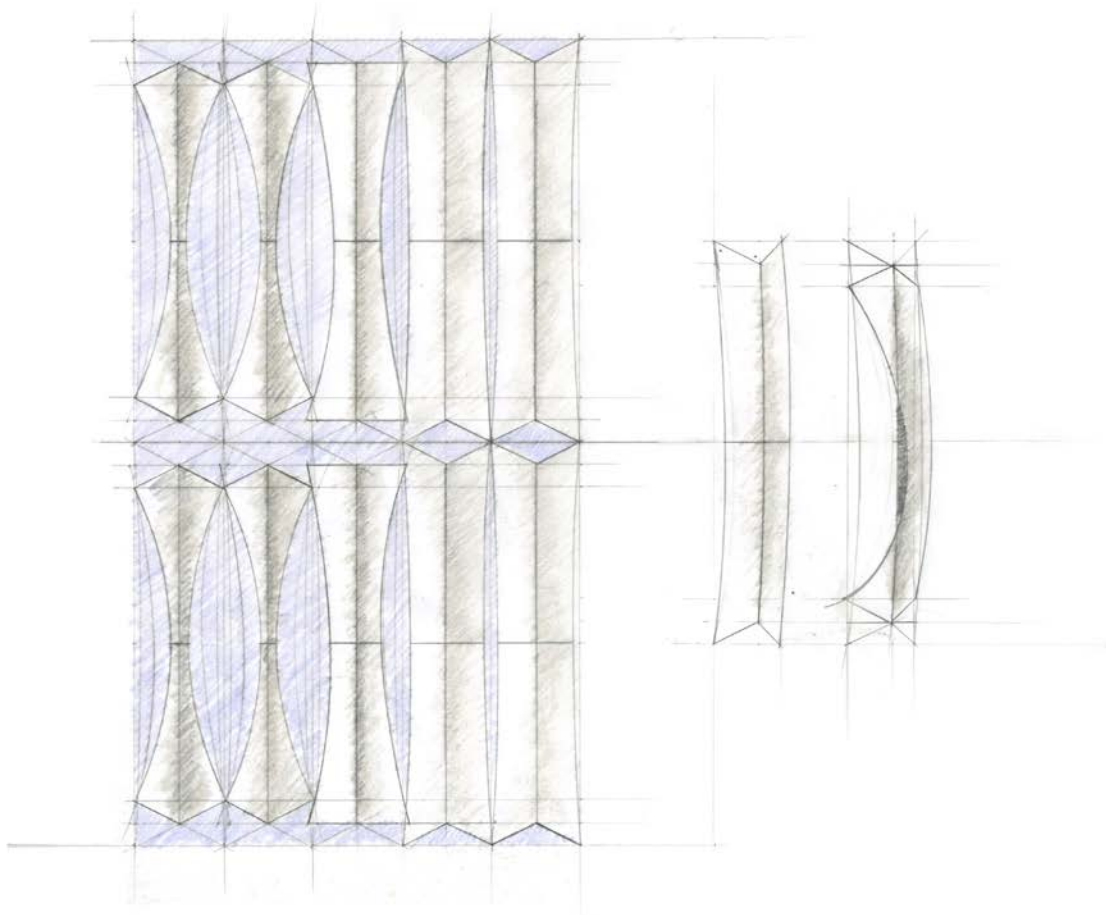
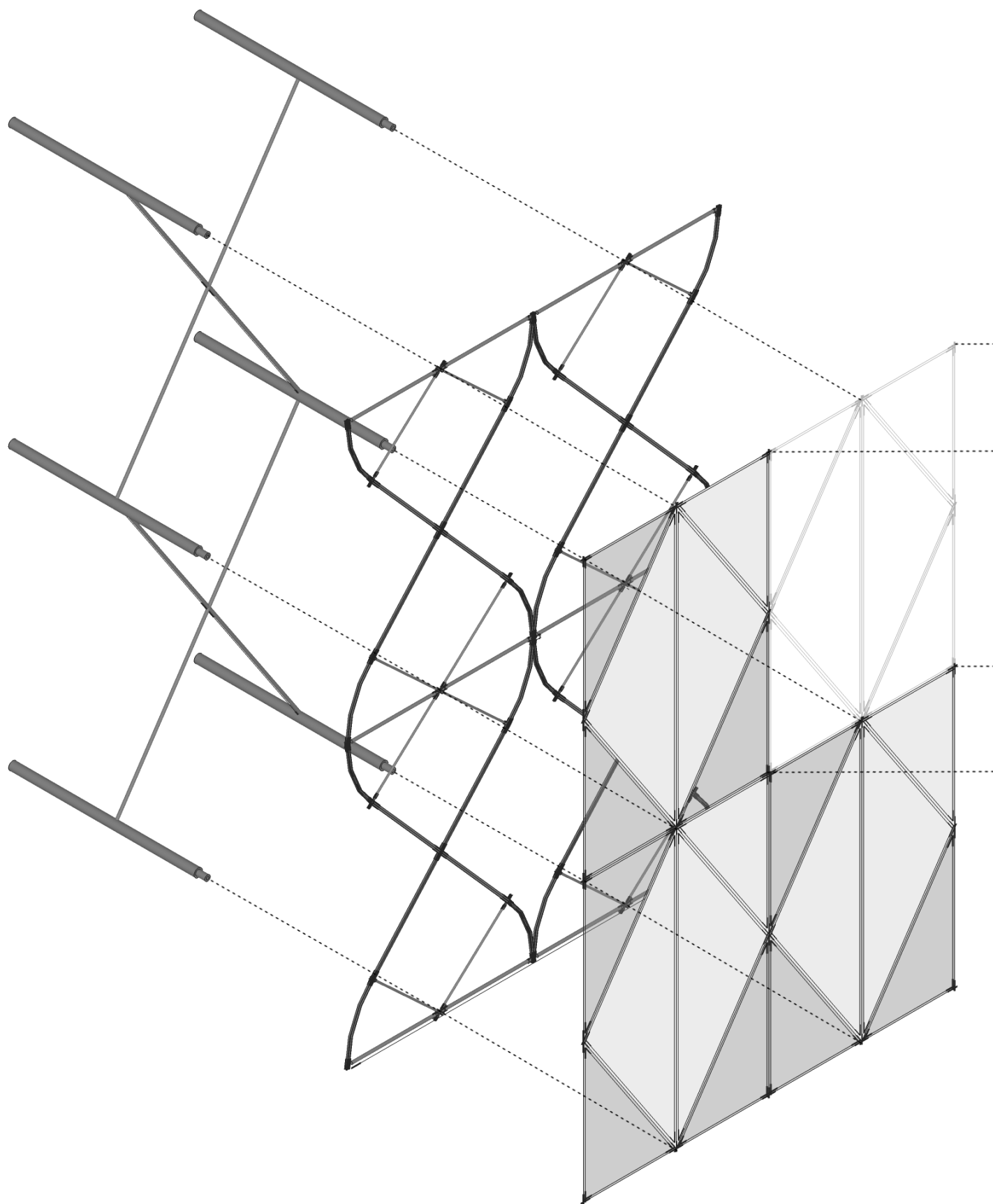


Figure 38: Exploded axonometric of the buildings 'big ideas'. What is of particular significance was the decision to articulate the buildings ,most public, East facade as an exploration of didactic opportunities in architecture.







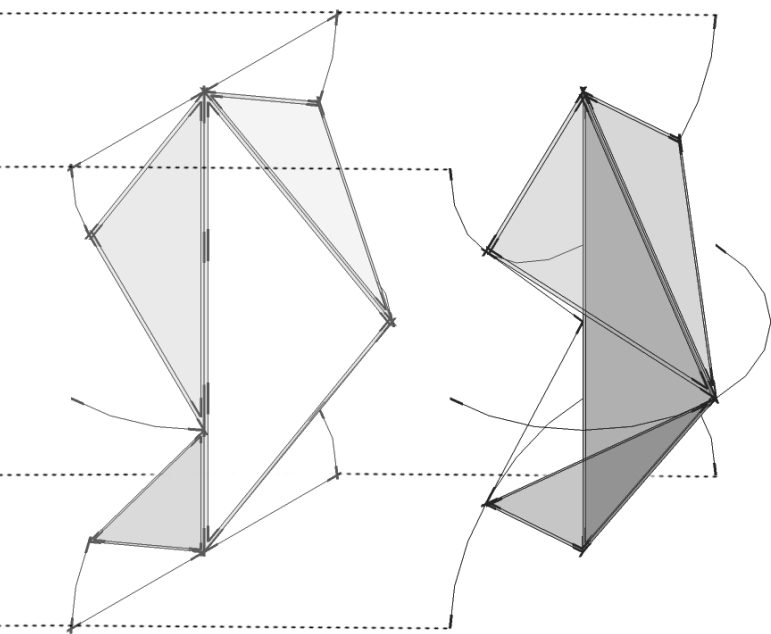
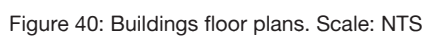


Figure 39: Exploded isometric view of the buildings skin technology. Skin is locally openable through a system of gears and levers.





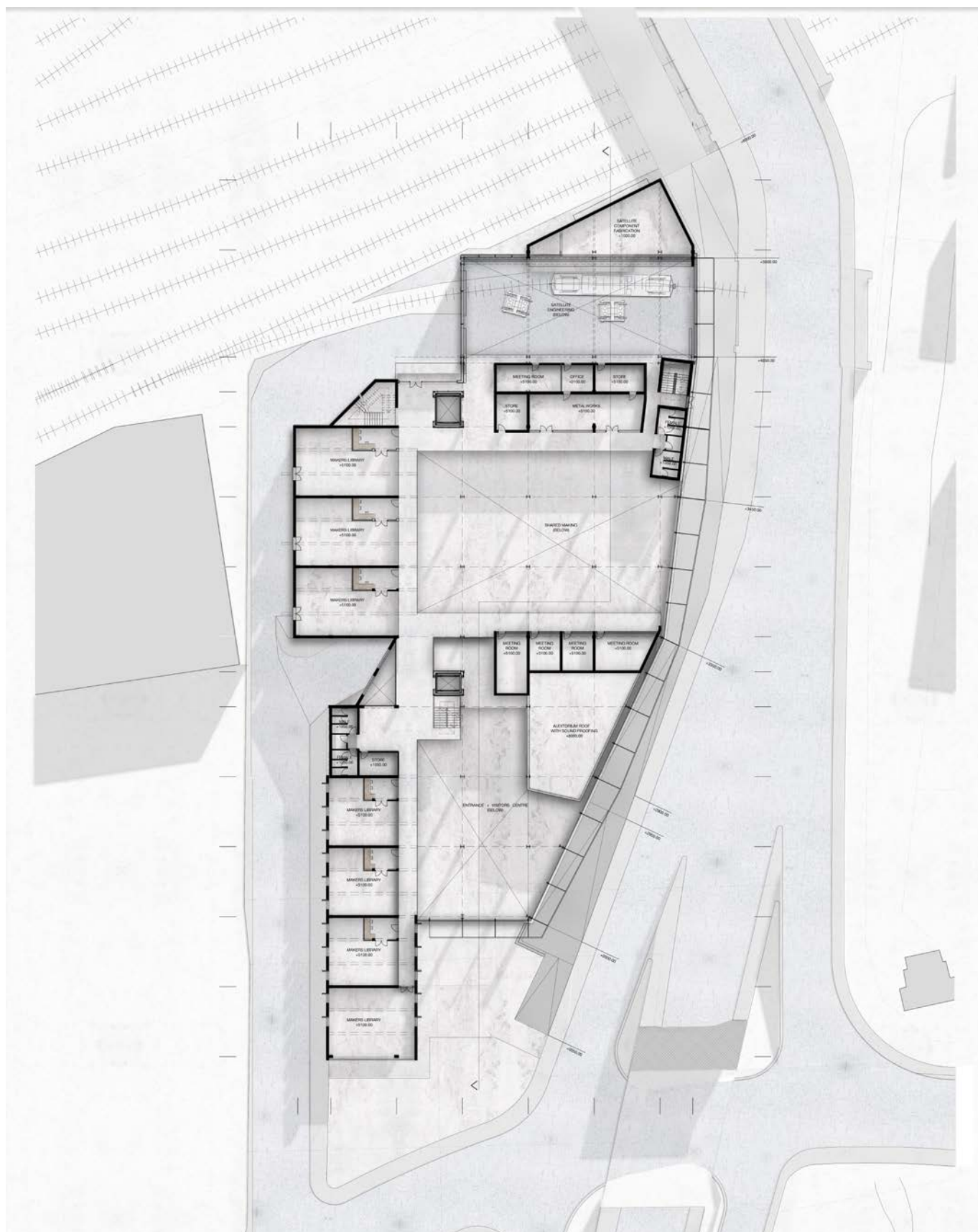


Figure 41: Exploded axonometric drawing of Building. Scale:  
NTS

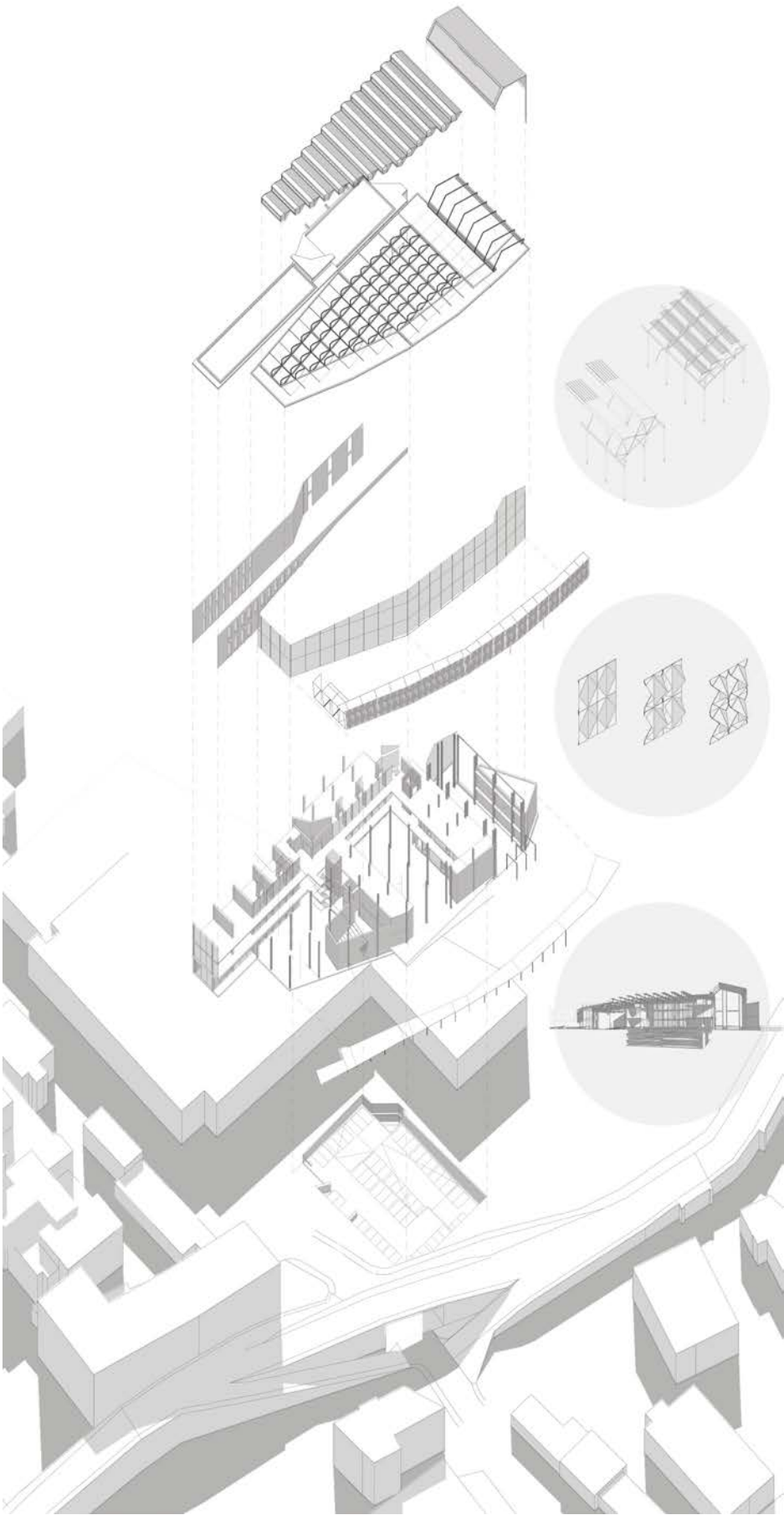




Figure 42: 3D Views of Project.



Figure 43: Long section through building. Scale: NTS

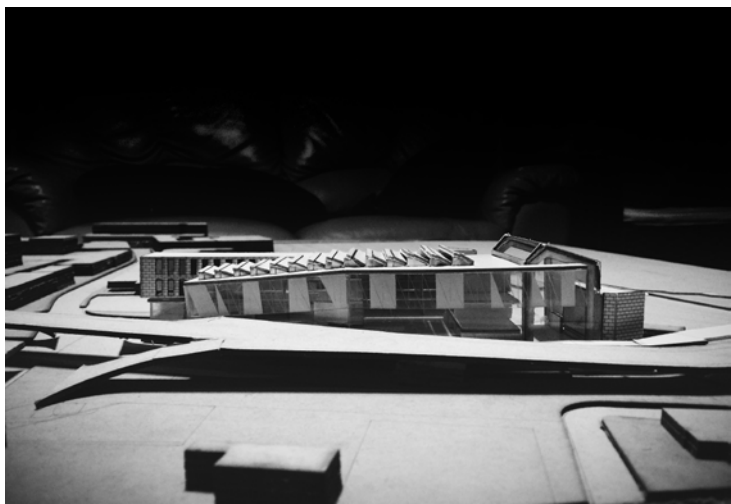
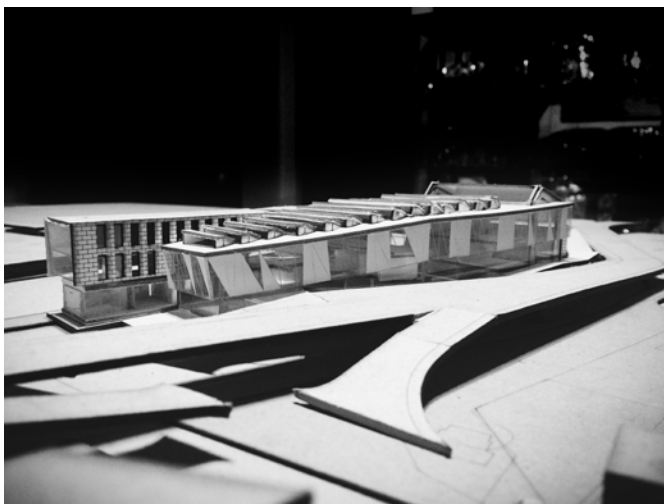
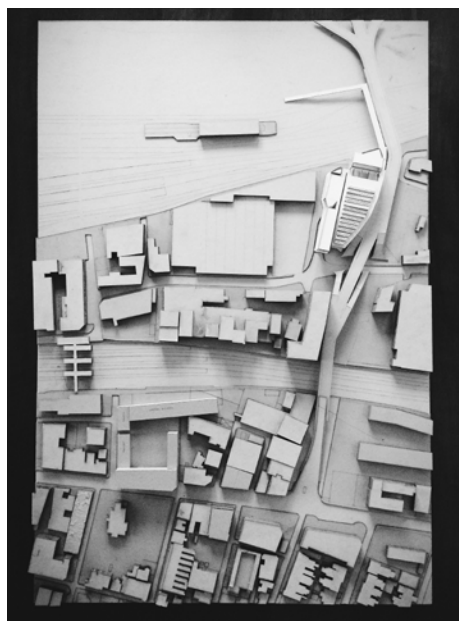
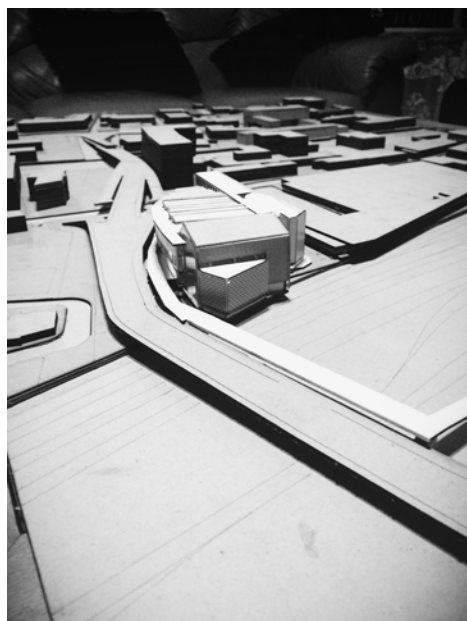


Figure 44: Model of building in context.





## Fundi Labs - Satellite Workshops

According to Robert Kronenberg portable architecture can follow 3 major strategies.

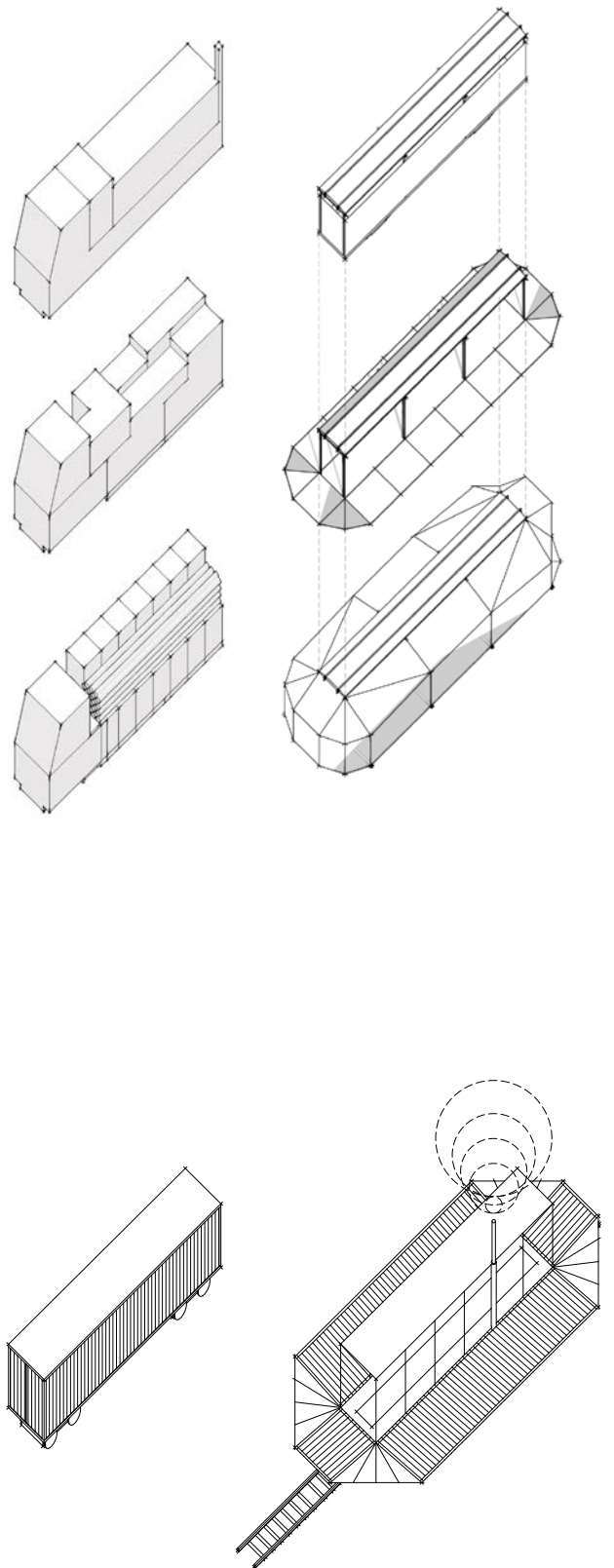
- \* The first is where the architecture is transported in one, completely assembled, ready to function piece. In some cases, the architecture can even house the mechanisms of mobility (as in the example of the Chinese Assault Tower).

- \* In the case of the second strategy, the building need only be partially assembled from a kit of parts. In this instance the way each individual component is stored and transported is a design constraint in and of itself.

- \* The third strategy involves breaking the building up into a system of modular units. This is the strategy which allows for the greatest flexibility in how the resulting structure can look since the user could have the ability to construct the structure as he or she likes. The size constraints for these units are also defined by the maximum size of the means of transport.

For the purposes of the first prototype for the Fundi Labs, I chose to embark on a design which would follow the second strategy of the three. This was because there would still be space for participation of the user in the construction of the project, however part of the structure would already exist, and could thus provide the user cues as to how the remaining construction could occur.

Other strategies for consideration were that of mobility. In order to gain a foothold in the needed knowledge for design of these rail-based workshops, it was important to gain a basic understanding of rail technology. A particularly useful study was that of the *Phelophepha* organisation. This Transnet initiative re-purposed rail carriages by retrofitting them into mobile health clinics. These clinics travel across the country to small towns where there are no health-care facilities nearby, and provide valuable services to these communities.



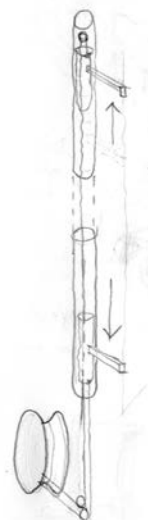
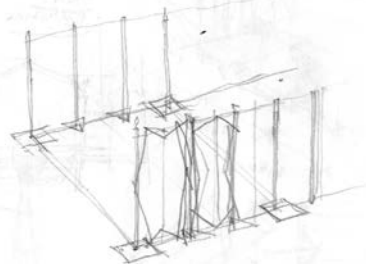
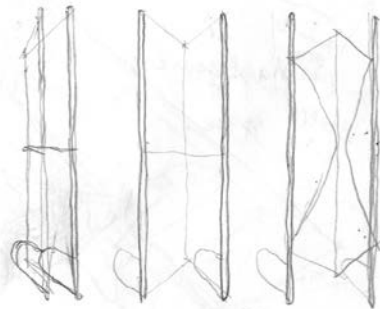
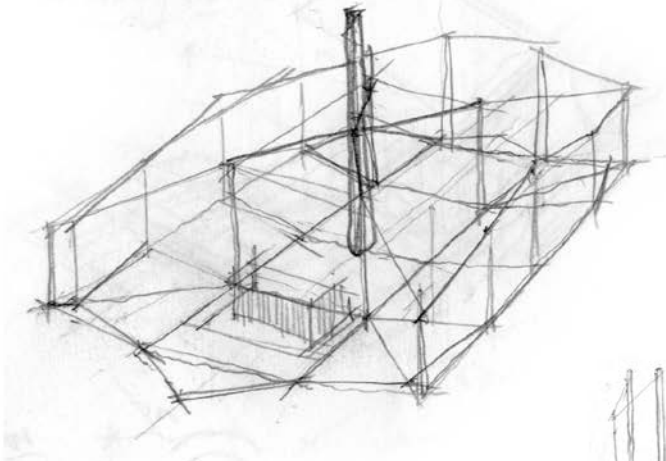
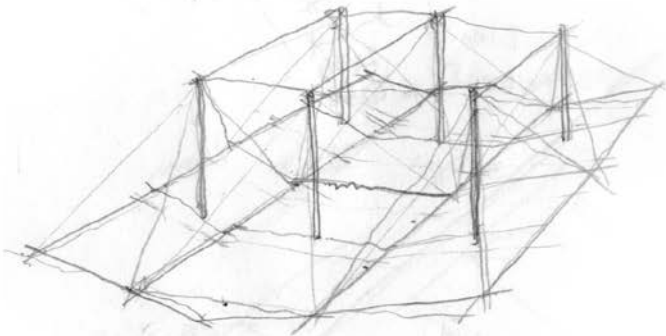
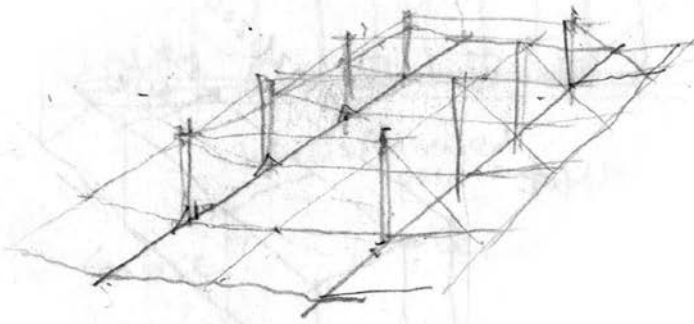


Figure 45: Concept sketches for the development of the Fundi Labs

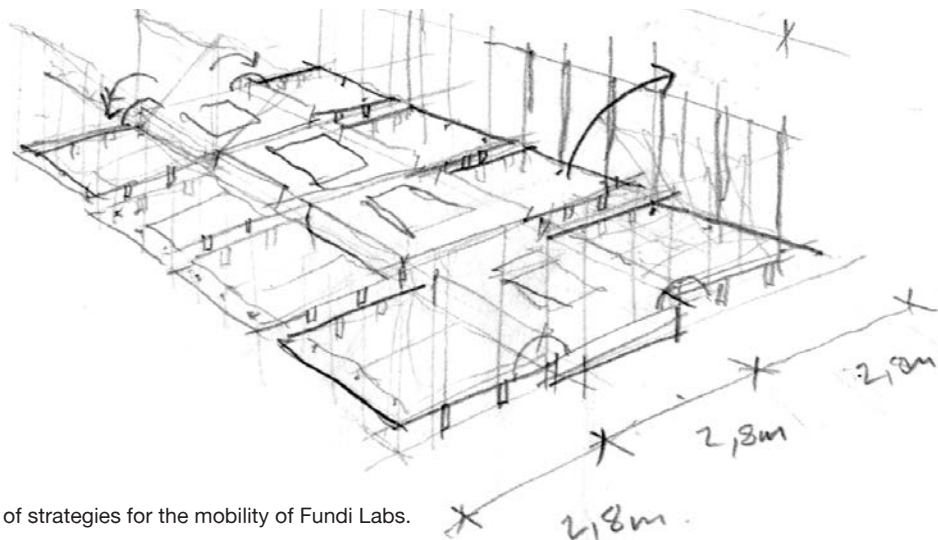
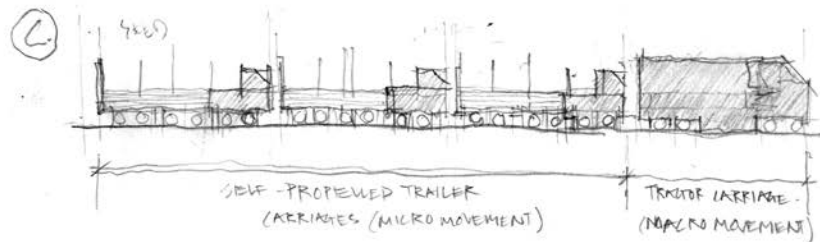
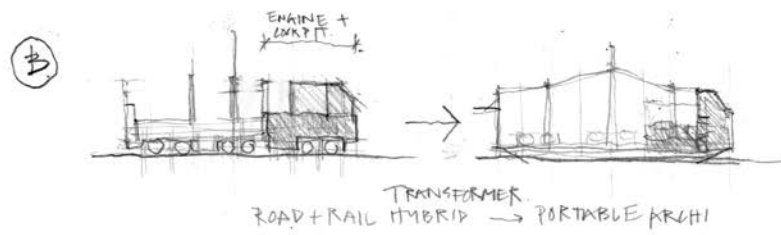
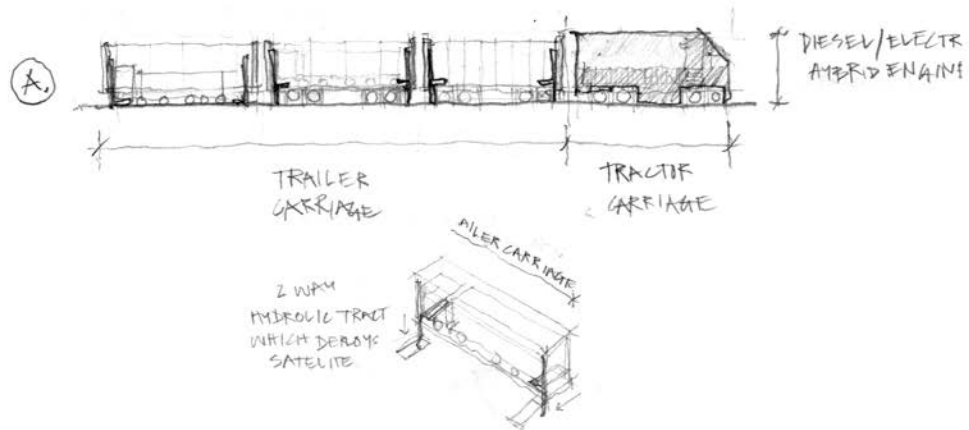


Figure 46: Exploration of strategies for the mobility of Fundi Labs.







# Conclusion

As architects, our role is to constantly think and work in critically reflective ways, continuously questioning the status quo of understanding and practice. Architecture has a great responsibility towards society to create enabling environments. This is not to say that architecture can, in and of itself, solve the great many social, political or economic challenges we may face. It must however generate opportunities for the individual or community to engage with a process of growth and betterment. As contemplated by Cedric Price whilst speaking about the teachings of Colin Penn,

*“Architecture should be concerned with extending both the individual and society’s capacity for changing habits, appetites and minds.”<sup>1</sup>*

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<sup>1</sup> Matthews, From Agit-Prop to Free Space: The Architecture of Cedric Price. p. 24

